# ANNUAL REGISTER

Harry Knox
Lieut., U.S.

OF THE

# UNITED STATES NAVAL ACADEMY,

ANNAPOLIS, MD.

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## THIRTIETH ACADEMIC YEAR,

## 1879-80.

WASHINGTON:
GOVERNMENT PRINTING OFFICE
1879.

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This book
was presented by
Rear Adm. Harry Knox, U.S.N.

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# THE
# UNITED STATES NAVAL ACADEMY.

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The United States Naval Academy was founded in 1845, by Hon. George Bancroft, Secretary of the Navy, in the administration of President James K. Polk. It was formally opened October 10, of that year, under the name of the Naval School, with Commander Franklin Buchanan as Superintendent. It was placed at Annapolis, Md., on the land occupied by Fort Severn, which was given up by the War Department for the purpose. The course was fixed at five years, of which the first and last only were spent at the School, the intervening three being passed at sea. This arrangement was not strictly adhered to, the exigencies of the service making it necessary, in many cases, to shorten the period of study. In January, 1846, four months after the opening of the School, the students consisted of 36 Midshipmen, of the date of 1840, who were preparing for the examination for promotion; 13 of the date of 1841, who were to remain until drafted for service at sea; and 7 Acting Midshipmen, appointed since September of the previous year. The Midshipmen of the date of 1840 were the first to be graduated, finishing their limited course in July, 1846, and they were followed in order by the subsequent dates until the reorganization of the School, in 1851.

In September, 1849, a Board was appointed to revise the plan and regulations of the Naval School. The Board was composed of the following officers:

Commodore William B. Shubrick,
Commander Franklin Buchanan,
Commander Samuel F. DuPont,
Commander George P. Upshur,
Surgeon W. S. W. Ruschenberger,
Professor William Chauvenet,
Captain Henry Brewerton, U. S. A.

The plan reported by the Board was approved, and went into operation July 1, 1850. The new organization provided for a course of seven years, the first two and last two at the School and the three intermediate years at sea. The School was placed under the supervision of the Bureau of Ordnance and Hydrography, and its name was changed to the United States Naval Academy. The corps of professors was enlarged, the course was extended, and the system of separate departments, with executive heads, was fully adopted It was provided that a Board of Visitors should make an annual inspection of the Academy, and report upon its condition to the Secretary of the Navy. A suitable vessel was attached to the Academy as a practice-ship, and the annual practice-cruises were begun.

After the system had been in operation a year new changes were proposed, and the recommendations of the Academic Board on the subject were referred to the Board of Examiners of the year 1851, composed of the following officers:

Commodore David Conner,
Captain Samuel L. Breese,
Commander C. K. Stribling,
Commander A. Bigelow,
Commander Franklin Buchanan,
Lieutenant Thomas T. Craven.

The change recommended by the Board of Examiners, and adopted by the Department, consisted mainly in leaving out the requirement of three years of sea-service in the middle of the course, thus making the four years of study consecutive. The practice-cruises supplied the place of the omitted sea-service, and gave better opportunities of training. The change went into operation in November, 1851, together with other improvements recommended by the Board. The system has continued, with slight modifications, to the present time. The first class to receive the benefit of it was that which entered in 1851. Six members of this class completed the course in three years, and were graduated in June, 1854; the rest of the class followed in 1855.

In May, 1861, on the outbreak of the war, the Academy was removed to Newport, R. I. The three upper classes were detached and ordered to sea, and the remaining Acting Midshipmen were quartered in the Atlantic House and on board the frigates Constitution and Santee. In September, 1865, the Academy was moved back to Annapolis, where it has since remained.

When the Bureau of Navigation was established, July 5, 1862, the Academy was placed under its supervision; March 1, 1867, it was placed under the direct care and supervision of the Navy Department, the administrative routine and financial management being still conducted through the Bureau. On the 11th of March, 1869, all official connection with the Bureau came to an end.

The term of the academic course was changed by law, March 3, 1873, from four to six years. The change took effect with the class which entered in the following summer.

In 1866, a class of Acting Third Assistant Engineers was ordered to the Academy for instruction. The course embraced the subjects of steam-engineering, iron-manufacture, chemistry, and mechanics, and practical exercises with the steam-engine and in the machine-shop. This class was graduated in June, 1868, together with two Cadet-Engineers who had entered the Academy in 1867. After an interval of four years, in October, 1871, a new class of Cadet-Engineers was admitted. This class followed a two years' course, somewhat more extended than that of the class of 1868, and was graduated in 1873. In 1872 and 1873, new classes were admitted, the first of which left the Academy in 1874 and the second in 1875. By an act of Congress approved February 24, 1874, the course of instruction for Cadet-Engineers was made four years instead of two; and the new provision was first applied to the class entering the Academy in the year 1874. This class was graduated in June, 1878.

## SUPERINTENDENTS OF THE NAVAL ACADEMY SINCE ITS FOUNDATION.

Assumed Command—

Sept. 3, 1845.—Commander Franklin Buchanan.
March 15, 1847.—Commander George P. Upshur.
July 1, 1850.—Commander Cornelius K. Stribling.
Nov. 1, 1853.—Commander Louis M. Goldsborough.
Sept. 15, 1857.—Captain George S. Blake.
Sept. 9, 1865.—Rear-Admiral David D. Porter.
Dec. 1, 1869.—Commodore John L. Worden.
Sept. 22, 1874.—Rear-Admiral C. R. P. Rodgers.
July 1, 1878.—Commodore Foxhall A. Parker.
Aug. 2, 1879.—Rear-Admiral George B. Balch.

## BOARD OF VISITORS, JUNE, 1879.

Commodore T. H. STEVENS, U. S. N., *President.*
Hon. M. J. DURHAM, Danville, Ky., *Vice-President.*
Chief-Engineer J. W. KING, U. S. N.
General JAMES GRANT WILSON, New York City.
General ELI H. MURRAY, Louisville, Ky.
Colonel WILLIAM GODDARD, Providence, R. I.
Captain JOHN M. BROOKE, Lexington, Va.
Hon. H. B. ANTHONY, Providence, R. I.
Hon. J. R. McPHERSON, Jersey City, N. J.
Hon. W. R. MYERS, Anderson, Ind.
Rev. EBENEZER BUSHNELL, Fremont, Ohio.

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## ACADEMIC CALENDAR.

### 1879--80.

| | | |
|---|---|---|
| 1879. | | |
| Oct. 1. | Beginning of first term | Wednesday. |
| 1880. | | |
| Jan. 26–31. | Semi-annual examination | Monday–Saturday. |
| Jan. 31. | End of first term | Saturday. |
| June 1–10. | Annual examination | Monday–Wednesday. |
| June 10. | End of academic year, 1879–80 | Wednesday. |
| June 11. | Examination of candidates for admission as Cadet-Midshipmen | Thursday. |
| Sept. 15. | Examination of candidates for admission as Cadet-Engineers | Tuesday. |
| Sept. 22. | Examination of candidates for admission as Cadet-Midshipmen | Tuesday. |
| Oct. 1. | Beginning of first term, 1880–81 | Thursday. |

The academic months end on the following days:

1879–80.

| | | | |
|---|---|---|---|
| October | Nov. 1 | February | Feb. 28 |
| November | Nov. 29 | March | Mar. 28 |
| December | Dec. 27 | April | Apr. 25 |
| January | Jan. 24 | May | May 30 |

# CALENDAR FOR 1879-80.

## SEPTEMBER.

| Sun. | M. | T. | W. | T. | F. | Sat. |
|---|---|---|---|---|---|---|
| .... | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | .... | .... | .... | .... |

## OCTOBER.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | .... | .... | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | .... |

## NOVEMBER.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | .... | .... | .... | .... | .... | 1 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | .... | .... | .... | .... | .... | .... |

## DECEMBER.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | .... | .... | .... |

## JANUARY.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | .... | .... | .... | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |

## FEBRUARY.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | .... | .... | .... | .... | .... | .... |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |

## MARCH.

| Sun. | M. | T. | W. | T. | F. | Sat. |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | .... | .... | .... | .... |

## APRIL.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | .... | .... | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22. | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | .... | .... |

## MAY.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | .... | .... | .... | .... | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | .... | .... | .... | .... | .... | .... |

## JUNE.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | .... | .... | .... | .... |

## SEPTEMBER.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | .... | 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | .... | .... | .... |

## OCTOBER.

| | | | | | | |
|---|---|---|---|---|---|---|
| .... | .... | .... | .... | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |

# OFFICERS

OF THE

# UNITED STATES NAVAL ACADEMY

---

REAR-ADMIRAL GEORGE B. BALCH

SUPERINTENDENT.

COMMANDER S. D. GREENE,

*Senior Aid to the Superintendent.*

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## ACADEMIC STAFF.

COMMANDER F. V. McNAIR,

*Commandant of Cadets.*

Lieutenant W. H. Brownson,

*Assistant to the Commandant of Cadets.*

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### SEAMANSHIP, NAVAL TACTICS, AND NAVAL CONSTRUCTION

COMMANDER E. M. SHEPARD,

*Head of Department.*

Lieutenant-Commander Francis A. Cook,
Lieutenant-Commander Edwin White,
Lieutenant Leavitt C. Logan,
Lieutenant D. Delehanty,

*Instructors in Seamanship, Naval Tactics, and Naval Construction*

Matthew Strohm,

*Instructor in Boxing, Swimming, and Gymnastics.*

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### ORDNANCE AND GUNNERY

COMMANDER A. T. MAHAN,

*Head of Department.*

Lieutenant John C. Soley,
Lieutenant W. H. Parker, Jr.,
Lieutenant J. W. Miller,
Lieutenant Richard Rush,

*Instructors in Naval Gunnery, and Infantry Tactics*

Antoine J. Corbesier,

*Sword-Master.*

Jean B. Retz,
George Heintz,

*Assistant Sword-Masters.*

# OFFICERS OF THE UNITED STATES NAVAL ACADEMY.

## MATHEMATICS.

PROFESSOR W. W. HENDRICKSON

*Head of Department.*

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Lieutenant Benjamin F. Tilley,
Lieutenant S. C. Paine,
Lieutenant H. O. Rittenhouse,
Lieutenant G. L. Dyer,
Master C. W. Bartlett,

*Instructors in Mathematics.*

---

## STEAM-ENGINEERING.

CHIEF ENGINEER J. P. SPRAGUE,

*Head of Department.*

Passed Assistant Engineer L. W. Robinson, C. E., M. M. E.,
Passed Assistant Engineer J. C. Kafer,
Passed Assistant Engineer C. H. Manning,
Passed Assistant Engineer R. W. Milligan,
Passed Assistant Engineer G. H. Kearny,
Assistant Engineer A. Mattice,
Assistant Engineer A. V. Zane,

*Instructors in Steam-Engineering.*

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## ASTRONOMY, NAVIGATION, AND SURVEYING.

LIEUTENANT-COMMANDER ALLAN D. BROWN,

*Head of Department.*

Lieutenant-Commander C. J. Train,
Lieutenant Raymond P. Rodgers,
Lieutenant William J. Barnette,

*Instructors in Astronomy, Navigation, and Surveying.*

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## PHYSICS AND CHEMISTRY.

PROFESSOR HENRY D. TODD,

*Head of Department.*

Lieutenant Charles Belknap,
Master Sidney A. Staunton,
Professor N. M. Terry, A. M., Ph. D.,
Professor Charles E. Munroe, S. B.,

*Instructors in Physics and Chemistry.*

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## MECHANICS AND APPLIED MATHEMATICS.

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*Head of Department.*

Lieutenant M. R. S. Mackenzie,
Lieutenant Samuel W. Very,
Lieutenant Charles A. Stone,

*Instructors in Mechanics and Applied Mathematics.*

### ENGLISH STUDIES, HISTORY, AND LAW.

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*Head of Department.*

Lieutenant Frederick M. Wise,
Lieutenant John V. B. Bleecker,
Lieutenant Robert T. Jasper,
Lieutenant George W. Tyler,
Master Charles H. Lyman,
Master Charles R. Miles,
Assistant Professor William W. Fay, A. M.,
*Instructors in English Studies, History, and Law.*

### MODERN LANGUAGES.

PROFESSOR L. F. PRUD'HOMME, A. M.,
*Head of Department.*

Lieutenant Arthur B. Speyers,
Assistant Professor A. V. S. Courcelle,
Assistant Professor Eugene Dovilliers,
Assistant Professor Jules Leroux,
Assistant Professor Hippolyte Dalmon,
*Instructors in French and Spanish.*

Professor Pedro Montaldo,
*Instructor in Spanish.*

### DRAWING.

PROFESSOR MARSHAL OLIVER,
*Head of Department.*

Master Corwin P. Rees,
Assistant Professor C. F. Blauvelt, N. A.,
*Instructors in Drawing.*

## OFFICERS NOT ATTACHED TO THE ACADEMIC STAFF.

COMMANDER HENRY B. ROBESON, *In charge of Practice-Ships.*
MEDICAL DIRECTOR A. L. GIHON, A. M., M. D.
SURGEON M. L. RUTH, M. D.
PASSED ASSISTANT SURGEON ROBERT SWAN, M. D.
PAYMASTER A. S. KENNY, A. B., *Commissary.*
PAYMASTER F. H. SWAN, *Storekeeper.*
PAYMASTER W. N. WATMOUGH, *Treasurer.*
CHAPLAIN ROBERT HUDSON, M. A.
ASSISTANT PROFESSOR THOMAS KARNEY, A. M., *Librarian.*
J. J. GRAFF, *Assistant Librarian.*
R. M. CHASE, *Secretary.*

### MARINE GARRISON.

CAPTAIN ROBERT W. HUNTINGTON, *Commanding.*
First Lieutenant George B. Haycock.

Boatswain C. E. Hawkins.
Gunner Robert Sommers.

### MATES.

| | |
|---|---|
| C. J. Murphy | *Attached to the United States Gunnery-ship Santee and to the Sloop-of-war Dale.* |
| Samuel Gee | |
| William G. Smith | |
| James Hill | |
| Robert Silver | *Attached to the United States Steamer Nantucket (iron-clad).* |
| Benjamin G. Perry | *Attached to the United States Steamer Phlox (steam-tender).* |
| Joseph Rodgers | |

# ACADEMIC BOARD.

REAR ADMIRAL G. B. BALCH, U. S. N.
COMMANDER F. V McNAIR, U. S. N.
COMMANDER A. T. MAHAN, U. S. N.
COMMANDER E. M. SHEPARD, U. S. N.
PROFESSOR W. W. HENDRICKSON, U. S. N.
CHIEF ENGINEER J. P. SPRAGUE, U. S. N.
LIEUTENANT-COMMANDER A. D. BROWN, U. S. N
PROFESSOR J. M. RICE, S. B., U. S. N.
PROFESSOR J. R. SOLEY, A. B., U. S. N.
PROFESSOR H. D. TODD, U. S. N.
PROFESSOR L. F. PRUD'HOMME, A. M.
PROFESSOR MARSHAL OLIVER.

# CADET-OFFICERS.

### CADET-LIEUTENANT-COMMANDER

FRANCIS J. HAESELER.

### CADET-LIEUTENANTS.

H. C. POUNDSTONE.
FRANKLIN SWIFT.
JOSEPH BEALE.
P. W. HOURIGAN.

### CADET-MASTERS.

M. C. GORGAS.
A. CRAMER.
E. SIMPSON, JR.
J. S. WATTERS.

P. R. ALGER, *Adjutant.*

### CADET-ENSIGNS.

L. S. NORTON.
G. L. DILLMAN.
C. CABANISS.
W. J. MAXWELL.

### CADET-PETTY-OFFICERS.

*First Captains of Gun's Crews.*

J. C. Drake.
O. H. P. Belmont.
W. S. Sims.
J. B. Bernadou.
J. F. Luby.
L. S. Van Duzer.
W. Truxtun.
A. P. Niblack.
F. R. Brainard.
W. W. Buchanan.
T. Worthington.
James Gray.
J. H. Rohrbacker.
A. R. Howze.
H. L. Fillebrown.
W. H. Wolfersberger

*Second Captains of Gun's Crews.*

F. W. Bowdon.
A. A. Ackerman.
J. L. Shock.
J. A. Hoogewerff.
F. C. Rider.
R. B. Dashiell.
R. P. Forshew.
A. S. McCrea.
F. H. Hunicke.
C. P. George.
W. H. Stayton.
G. G. Rodgers.
W. L. Emmet.
M. Craven.
G. P. Blow.
J. H. Lindsey.

### CADET-PASSED-ASSISTANT-ENGINEER.

W. F. DURAND.

### CADET-ASSISTANT-ENGINEERS.

A. W STAHL.
C. E. MANNING.

*Cadet-Machinists.*

W. S. Sample.
A. E. Smith.
H. Hall.
L. D. Miner.
J. L. Wood.
T. W. Kinkaid.
A. O. Young.
A. T. Woods.

## ADET-MIDSHIPMEN.

*Class of* 1879—41 *members.*

| Order of general merit. | Name. | State. | Date of admission. | Age at date of admission. |  | Order of merit in— |  |  |  |  |  |  |  |  | Number of demerits. | Sea-service in practice-ships. |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Years. | Months. | Seamanship. | Naval construction. | Naval architecture (elective. | Ordnance. | Marine engines. | Navigation. | Light and heat. | Law. | Spanish. |  | Months. | Days. |
| *1 | **Miner, Randolph Huntington** | Ohio | June 19, 1875 | 15 | 7 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 1 | 3 | 29 | 4 | 19 |
| *2 | **Hood, John** | Alabama | Sept. 15, 1875 | 15 | 9 | 5 | 4 | 2 | 3 | 1 | 1 | 1 | 2 | 12 | 85 | 4 | 19 |
| *3 | **Clements, Abner Brush** | Missouri | June 21, 1875 | 17 | 6 | 15 | 9 | 1 | 14 | 4 | 2 | 2 | 5 | 11 | 50 | 4 | 19 |
| *4 | **Hayden, Edward Everett** | Massachusetts | June 21, 1875 | 16 | 2 | 13 | 5 | 4 | 9 | 5 | 4 | 7 | 9 | 2 | 71 | 4 | 19 |
| 5 | Chase, Henry Sanders | Louisiana | June 21, 1875 | 16 | 10 | 9 | 14 | 5 | 4 | 3 | 6 | 4 | 6 | 3 | 99 | 4 | 19 |
| 6 | Moore, John McConnell | Indiana | June 21, 1875 | 17 | 6 | 6 | 2 | 6 | 7 | 10 | 8 | 8 | 3 | 6 | 85 | 4 | 19 |
| 7 | Garrett, Le Roy Mason | New York | Sept. 16, 1875 | 18 | 0 | 2 | 11 | ...... | 5 | 8 | 5 | 9 | 10 | 1 | 54 | 4 | 19 |
| 8 | Marsh, Charles Carleton | Indiana | Sept. 14, 1875 | 17 | 1 | 10 | 7 | ..... | 10 | 14 | 10 | 10 | 7 | 5 | 103 | 4 | 19 |
| 9 | Sloan, Robert Sage | New York | June 21, 1875 | 15 | 7 | 7 | 8 | ...... | 1 | 14 | 14 | 16 | 12 | 23 | 73 | 4 | 19 |
| 10 | Jungen, Charles William | Wisconsin | Sept. 24, 1874 | 15 | 6 | 7 | 12 | ..... | 12 | 12 | 17 | 15 | 13 | 10 | 62 | 4 | 19 |
| 11 | Blish, John Bell | Indiana | Sept. 15, 1875 | 15 | 0 | 12 | 30 | ...... | 16 | 9 | 13 | 20 | 8 | 14 | 76 | 4 | 19 |
| 12 | Harlow, Charles Henry | New York | Sept. 15, 1875 | 17 | 0 | 4 | 1 | ..... | 6 | 7 | 12 | 27 | 14 | 7 | 43 | 4 | 19 |
| 13 | Wike, Harvey | Illinois | Sept. 16, 1875 | 14 | 5 | 21 | 28 | 7 | 24 | 21 | 7 | 5 | 32 | 33 | 125 | 4 | 19 |
| 14 | Gill, William Andrew | Pennsylvania | June 21, 1875 | 16 | 5 | 14 | 10 | .... | 11 | 6 | 9 | 5 | 22 | 16 | 103 | 4 | 19 |
| 15 | Schwerin, Rennie Pierre | New York | Sept. 25, 1874 | 16 | 1 | 11 | 6 | ..... | 8 | 16 | 14 | 12 | 16 | 19 | 50 | 4 | 19 |
| 16 | Ripley, Charles Stedman | At large | June 17, 1875 | 17 | 11 | 32 | 15 | ..... | 30 | 11 | 30 | 27 | 20 | 27 | 43 | 4 | 19 |
| 17 | Gibson, John | Kentucky | Feb. 16, 1874 | 18 | 0 | 29 | 25 | ..... | 17 | 18 | 16 | 14 | 19 | 30 | 30 | 4 | 19 |
| 18 | Cahoon, James Blake | Vermont | June 10, 1874 | 17 | 6 | 16 | 25 | ..... | 15 | 22 | 19 | 17 | 18 | 20 | 34 | 4 | 19 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | Sears, Walter Jesse | Pennsylvania | June 21, 1875 | 17 | 8 | 17 | 18 | ...... | 18 | 13 | 11 | 10 | 20 | 8 | 61 | 4 | 19 |
| 20 | Garrett, Leigh Osborn | Illinois | Sept. 13, 1875 | 15 | 1 | 1 | 16 | ...... | 13 | 24 | 20 | 23 | 26 | 25 | 64 | 4 | 19 |
| 21 | Menefee, Daniel Preston | California | Sept. 25, 1874 | 16 | 6 | 20 | 20 | ...... | 23 | 25 | 24 | 19 | 27 | 8 | 74 | 4 | 19 |
| 22 | Snowden, Thomas | New York | June 21, 1875 | 17 | 10 | 30 | 23 | ...... | 19 | 30 | 21 | 29 | 4 | 15 | 22 | 4 | 19 |
| 23 | Dougherty, John Allen | Missouri | June 12, 1874 | 16 | 9 | 18 | 27 | ...... | 20 | 26 | 22 | 35 | 29 | 29 | 37 | 4 | 19 |
| 24 | Bell, John Arthur | West Virginia | June 13, 1874 | 16 | 11 | 26 | 32 | ...... | 25 | 17 | 29 | 24 | 23 | 32 | 85 | 4 | 19 |
| 25 | Tillman, Edwin Hord | Tennessee | Sept. 14, 1874 | 16 | 10 | 37 | 22 | ...... | 35 | 19 | 28 | 13 | 29 | 36 | 85 | 4 | 19 |
| 26 | Kellogg, Francis Woodruff | Connecticut | June 21, 1875 | 17 | 10 | 26 | 35 | ...... | 29 | 20 | 17 | 20 | 31 | 26 | 71 | 4 | 19 |
| 27 | Gibbons, John Henry | Michigan | Sept. 15, 1875 | 16 | 8 | 34 | 18 | ...... | 21 | 31 | 27 | 31 | 16 | 18 | 104 | 4 | 19 |
| 28 | Robinson, Herbert Judson | New Hampshire | Sept. 15, 1875 | 16 | 6 | 25 | 23 | ..... | 36 | 38 | 37 | 24 | 33 | 12 | 132 | 4 | 19 |
| 29 | Cunningham, Andrew Chase | New York | June 9, 1874 | 16 | 4 | 21 | 36 | ...... | 26 | 40 | 41 | 41 | 41 | 40 | 70 | 4 | 19 |
| 30 | Barnard, Louis Hall | Colorado | June 13, 1874 | 16 | 11 | 23 | 34 | ...... | 33 | 38 | 34 | 36 | 34 | 17 | 76 | 4 | 19 |
| 31 | Brown, Guy Warner | Indiana | June 19, 1875 | 17 | 2 | 26 | 36 | ...... | 32 | 23 | 32 | 22 | 25 | 37 | 43 | 4 | 19 |
| 32 | Thom, William Arthur | At large | June 21, 1875 | 17 | 8 | 38 | 32 | ..... | 27 | 34 | 25 | 34 | 24 | 22 | 26 | 4 | 19 |
| 33 | Lopez, Robert Files | Tennessee | Sept. 29, 1874 | 17 | 6 | 36 | 38 | ...... | 40 | 32 | 36 | 31 | 36 | 30 | 84 | 4 | 19 |
| 34 | Drayton, Percival Langdon | At large | June 10, 1874 | 16 | 2 | 24 | 17 | ...... | 37 | 26 | 30 | 30 | 27 | 21 | 107 | 4 | 19 |
| 35 | Read, Maurice Lance | South Carolina | Sept. 28, 1874 | 15 | 10 | 35 | 31 | ..... | 31 | 26 | 33 | 33 | 11 | 23 | 61 | 4 | 19 |
| 36 | Mudd, John Alexis | At large | Sept. 11, 1875 | 15 | 3 | 33 | 21 | ..... | 27 | 37 | 26 | 37 | 37 | 35 | 125 | 4 | 19 |
| 37 | Graham, William Alfred | New York | Sept. 28, 1874 | 14 | 11 | 31 | 38 | ...... | 38 | 34 | 38 | 38 | 38 | 37 | 57 | 4 | 19 |
| 38 | Bitler, Reuben Oscar | Pennsylvania | June 19, 1875 | 16 | 1 | 39 | 40 | ..... | 41 | 33 | 40 | 40 | 35 | 28 | 77 | 2 | 19 |
| 39 | Purcell, John Lewis | New Jersey | Sept. 29, 1873 | 17 | 4 | 19 | 13 | ..... | 21 | 41 | 23 | 39 | 14 | 33 | 69 | 5 | 8 |
| 40 | Welsh, George Sivis | Pennsylvania | Sept. 24, 1874 | 17 | 7 | 41 | 29 | ...... | 33 | 26 | 34 | 26 | 40 | 40 | 106 | 4 | 19 |
| 41 | Sturdivant, Harry Leland | Maine | June 13, 1874 | 17 | 8 | 40 | 41 | ..... | 38 | 36 | 39 | 17 | 39 | 39 | 123 | 2 | 19 |

## CADET-MIDSHIPMEN.

*First class—61 members.*

| Order of annual merit. | Name. | State. | Date of admission. | Age at date of admission. | | Order of merit in— | | | | | | | | Number of demerits. | Sea-service in practice-ships. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Years. | Months. | Seamanship. | Naval tactics. | Ordnance instruction and infantry tactics. | Astronomy. | Electricity. | Mechanics and applied mathematics. | English composition. | French. | | Months. | Days. |
| 8 | Ackerman, Albert Ammerman | New Jersey | June 21, 1876 | 16 | 11 | 25 | 30 | 10 | 6 | 6 | 6 | 39 | 41 | 96 | 5 | 4 |
| *1 | **Alger, Philip Rounseville** | At large | Sept. 11, 1876 | 17 | 0 | 8 | 27 | 2 | 2 | 1 | 1 | 35 | 5 | 125 | 5 | 4 |
| 44 | Ashmore, Henry Beckwith | At large | Oct. 3, 1876 | 15 | 4 | 46 | 32 | 49 | 46 | 33 | 42 | 22 | 34 | 176 | 5 | 4 |
| 24 | Beale, Joseph | Pennsylvania | Oct. 12, 1874 | 14 | 10 | 9 | 30 | 38 | 29 | 26 | 31 | 48 | 16 | 122 | 5 | 4 |
| 49 | Belmont, Oliver Hazard Perry | New York | Sept. 30, 1874 | 14 | 10 | 46 | 65 | 44 | 50 | 50 | 46 | 56 | 9 | 225 | 5 | 5 |
| 4 | Bernadou, John Baptiste | At large | Sept. 12, 1876 | 17 | 10 | 10 | 44 | 4 | 21 | 15 | 2 | 15 | 1 | 132 | 5 | 4 |
| 37 | Bowdon, Frank Welch | Texas | Sept. 11, 1875 | 17 | 7 | 44 | 21 | 29 | 50 | 55 | 44 | 3 | 17 | 67 | 5 | 4 |
| 34 | Brainard, Fred Roland | Illinois | June 21, 1876 | 17 | 9 | 42 | 35 | 38 | 15 | 14 | 20 | 27 | 63 | 109 | 5 | 4 |
| 61 | Brinley, Edward | At large | Sept. 18, 1876 | 16 | 3 | 66 | 39 | 62 | 55 | 62 | 46 | 60 | 49 | 92 | 5 | 4 |
| 59 | Brown, James Stephen | Tennessee | Sept. 11, 1875 | 17 | 2 | 61 | 51 | 61 | 61 | 34 | 48 | 48 | 62 | 122 | 5 | 4 |
| 15 | Buchanan, Wilson Wildman | Ohio | June 19, 1875 | 17 | 3 | 11 | 7 | 14 | 5 | 18 | 12 | 62 | 48 | 33 | 5 | 5 |
| 60 | Bullitt, Howard Henry | Kentucky | Sept. 11, 1875 | 17 | 11 | 59 | 66 | 66 | 60 | 61 | 57 | 35 | 64 | 94 | 5 | 4 |
| 25 | Cabaniss, Charles | Virginia | June 21, 1876 | 16 | 8 | 13 | 18 | 25 | 18 | 53 | 50 | 40 | 13 | 32 | 5 | 4 |
| 56 | Clark, Lewis Jacob | Alabama | Sept. 11, 1876 | 14 | 7 | 62 | 42 | 47 | 40 | 48 | 28 | 65 | 56 | 157 | 5 | 4 |
| 51 | Cramer, Ambrose | Maryland | Sept. 28, 1874 | 17 | 6 | 62 | 54 | 42 | 44 | 23 | 43 | 53 | (*a*) | 58 | 5 | 5 |
| 51 | Dewey, Theodore Gibbs | South Carolina | June 19, 1875 | 16 | 0 | 65 | 58 | 22 | 57 | 28 | 56 | 12 | 46 | 140 | 5 | 4 |
| 38 | Dickson, Joseph Morrill | Texas | June 14, 1876 | 15 | 5 | 51 | 46 | 35 | 20 | 39 | 25 | 47 | 20 | 31 | 5 | 4 |
| 17 | Dillman, George Lincoln | Iowa | June 19, 1876 | 16 | 1 | 20 | 48 | 47 | 24 | 40 | 11 | 34 | 21 | 119 | 5 | 4 |
| 36 | Drake, James Calhoun | Arkansas | June 19, 1875 | 17 | 11 | 45 | 22 | 44 | 40 | 56 | 14 | 38 | 43 | 100 | 5 | 4 |
| *2 | **Dresel, Herman George** | Ohio | Sept. 18, 1876 | 17 | 8 | 7 | 11 | 1 | 7 | 3 | 3 | 6 | 2 | 85 | 5 | 4 |
| 32 | Duncan, Louis | Kentucky | Sept. 11, 1876 | 15 | 6 | 23 | 63 | 32 | 34 | 17 | 25 | 25 | 45 | 116 | 5 | 4 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | Emerson, William Henry | At large | Oct. 10, 1876 | 16 | 4 | 33 | 28 | 42 | 25 | 13 | 18 | 44 | 37 | 85 | 5 | 4 |
| 33 | Eyre, Manning Kennard | At large | Sept. 11, 1876 | 15 | 6 | 25 | 32 | 63 | 36 | 19 | 32 | 37 | 14 | 209 | 5 | 4 |
| 48 | Fillebrown, Horatio Ladd | South Carolina | June 19, 1875 | 16 | 1 | 53 | 58 | 38 | 49 | 40 | 35 | 23 | 51 | 95 | 5 | 4 |
| 40 | Finley, Henry Marzette | Ohio | June 21, 1875 | 16 | 5 | 43 | 52 | 60 | 38 | 30 | 41 | 9 | 19 | 175 | 5 | 4 |
| 55 | French, George Ross | At large | June 21, 1875 | 17 | 11 | 57 | 32 | 65 | 54 | 60 | 37 | 33 | 39 | 149 | 7 | 23 |
| 16 | Gorgas, Miles Carpenter | At large | Sept. 11, 1875 | 14 | 2 | 18 | 5 | 16 | 27 | 35 | 13 | 51 | 11 | 156 | 5 | 5 |
| 57 | Gray, James | Illinois | Sept. 12, 1876 | 17 | 8 | 40 | 60 | 50 | 46 | 50 | 50 | 51 | 59 | 146 | 5 | 4 |
| 23 | Haeseler, Francis Joy | Pennsylvania | Sept. 12, 1876 | 16 | 5 | 4 | 6 | 7 | 29 | 32 | 32 | 60 | 50 | 90 | 5 | 4 |
| 11 | Haskell, Porter David | Michigan | Sept. 12, 1876 | 17 | 4 | 16 | 13 | 16 | 10 | 12 | 19 | 20 | 12 | 23 | 5 | 4 |
| 35 | Hill, Charles Homer | Wisconsin | Sept. 14, 1875 | 16 | 0 | 5 | 10 | 54 | 42 | 15 | 27 | 48 | 57 | 244 | 4 | 16 |
| 6 | Hourigan, Patrick William | New York | June 21, 1876 | 16 | 7 | 1 | 3 | 4 | 8 | 5 | 9 | 1 | 15 | 164 | 5 | 4 |
| 22 | Howze, Arthur Robertson | Mississippi | June 21, 1876 | 15 | 7 | 37 | 26 | 55 | 39 | 29 | 15 | 57 | 6 | 33 | 5 | 4 |
| 54 | Huntoon, Fitz-Aubert | Texas | Sept. 15, 1875 | 16 | 10 | 41 | 54 | 50 | 55 | 19 | 50 | 57 | 58 | 131 | 5 | 4 |
| 41 | Lieper, Edwards Fayssoux | Pennsylvania | June 21, 1875 | 16 | 7 | 30 | 17 | 19 | 48 | 58 | 59 | 63 | 27 | 57 | 5 | 4 |
| 53 | Luby, John Frazer | New York | June 21, 1875 | 17 | 11 | 27 | 61 | 25 | 59 | 56 | 54 | 66 | 55 | 136 | 5 | 5 |
| 45 | Maxwell, William John | At large | June 9, 1874 | 15 | 2 | 34 | 28 | 31 | 43 | 45 | 59 | 29 | 38 | 100 | 5 | 4 |
| 31 | Mayer, Augustus Newkirk | Iowa | June 17, 1876 | 17 | 3 | 20 | 13 | 20 | 22 | 27 | 53 | 21 | 35 | 115 | 5 | 4 |
| 14 | Morgan, Stokely | Arkansas | June 14, 1876 | 16 | 11 | 20 | 12 | 16 | 13 | 8 | 16 | 10 | 36 | 66 | 5 | 4 |
| 29 | Muir, William Carpenter Pendleton | Kentucky | June 21, 1876 | 17 | 3 | 53 | 20 | 33 | 22 | 38 | 32 | 2 | 23 | 134 | 5 | 4 |
| 58 | Nash, Edwin White | Ohio | Sept. 11, 1876 | 16 | 11 | 50 | 22 | 59 | 50 | 35 | 55 | 41 | 53 | 220 | 5 | 4 |
| 9 | Niblack, Albert Parker | Indiana | Sept. 12, 1876 | 17 | 2 | 13 | 4 | 7 | 9 | 4 | 21 | 18 | 26 | 46 | 5 | 4 |
| 7 | Norton, Luman Spooner | Vermont | Sept. 12, 1876 | 17 | 0 | 15 | 8 | 10 | 3 | 2 | 4 | 41 | 24 | 128 | 5 | 4 |
| 20 | Parke, Thomas Aloysius | West Virginia | June 21, 1876 | 16 | 8 | 38 | 39 | 36 | 16 | 10 | 24 | 23 | 8 | 58 | 5 | 4 |
| 5 | Phelps, Harry | New Jersey | Sept. 13, 1876 | 15 | 7 | 3 | 2 | 6 | 4 | 9 | 5 | 44 | 10 | 105 | 5 | 4 |
| *3 | **Poundstone, Homer Clarke** | West Virginia | Sept. 24, 1874 | 14 | 0 | 2 | 1 | 3 | 1 | 7 | 8 | 13 | 7 | 65 | 5 | 5 |
| 47 | Richardson, Walter Gates | Massachusetts | Sept. 12, 1876 | 16 | 9 | 38 | 36 | 52 | 44 | 30 | 57 | 44 | 32 | 92 | 5 | 4 |
| 18 | Rohrbacker, Joseph Hamilton | Pennsylvania | June 21, 1876 | 17 | 9 | 28 | 19 | 24 | 19 | 23 | 21 | 6 | 29 | 63 | 5 | 4 |
| 29 | Safford, William Edwin | Ohio | Sept. 11, 1876 | 16 | 9 | 56 | 49 | 57 | 26 | 45 | 37 | 5 | 4 | 78 | 5 | 4 |
| 43 | Scott, Richard Hamilton | Minnesota | June 21, 1876 | 17 | 9 | 49 | 38 | 36 | 36 | 52 | 28 | 41 | 40 | 115 | 5 | 4 |
| 27 | Simpson, Edward, jr | Pennsylvania | June 21, 1876 | 17 | 8 | 12 | 9 | 12 | 34 | 45 | 48 | 29 | 42 | 107 | 5 | 4 |
| 42 | Sims, William Sowden | At large | June 21, 1876 | 15 | 9 | 32 | 47 | 28 | 33 | 23 | 39 | 53 | 54 | 148 | 5 | 4 |
| 50 | Swift, Franklin | Massachusetts | June 9, 1874 | 16 | 1 | 46 | 42 | 52 | 50 | 19 | 45 | 32 | 61 | 98 | 5 | 5 |
| 21 | Truxtun, William | At large | June 21, 1876 | 15 | 3 | 18 | 25 | 7 | 17 | 35 | 23 | 15 | 47 | 99 | 5 | 4 |
| 28 | Van Duzer, Louis Sayre | New York | Sept. 13, 1876 | 15 | 3 | 23 | 54 | 21 | 28 | 59 | 36 | 13 | 33 | 91 | 5 | 4 |

## CADET-MIDSHIPMEN.

*First class—61 members*—Continued.

| Order of annual merit. | Name. | State. | Date of admission. | Age at date of admission. |  | Order of merit in— |  |  |  |  |  |  |  | Number of demerits. | Sea-service in practice-ships. |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Years. | Months. | Seamanship. | Naval tactics. | Ordnance instruction and infantry tactics. | Astronomy. | Electricity. | Mechanics and applied mathematics. | English composition. | French. |  | Months. | Days. |
| 39 | Wall, Francis Richardson | Mississippi | June 23, 1876 | 16 | 11 | 51 | 13 | 44 | 29 | 40 | 40 | 19 | 28 | 100 | 5 | 4 |
| 19 | Watters, John Sproston | At large | June 21, 1876 | 14 | 11 | 6 | 24 | 13 | 29 | 43 | 28 | 29 | 18 | 133 | 5 | 4 |
| 12 | West. George Ernest | New York | Sept. 12, 1876 | 14 | 5 | 34 | 36 | 29 | 10 | 22 | 7 | 26 | 22 | 89 | 5 | 4 |
| 13 | Wilkinson, Ernest | Louisiana | June 19, 1875 | 17 | 2 | 30 | 57 | 25 | 12 | 44 | 17 | 4 | 3 | 123 | 5 | 5 |
| 10 | Wolfersberger, William Henry | Illinois | Sept. 12, 1876 | 17 | 7 | 29 | 13 | 15 | 14 | 11 | 10 | 10 | 29 | 56 | 5 | 4 |
| 46 | Worthington, Thomas | Alabama | June 19, 1876 | 16 | 7 | 36 | 52 | 34 | 57 | 63 | 59 | 6 | 24 | 136 | 5 | 4 |

## CADET-MIDSHIPMEN.

*Second class—79 members.*

| Order of annual merit. | Name. | State. | Date of admission. | Age at date of admission. |  | Order of merit in— |  |  |  |  | Number of demerits. | Sea-service in practice-ships. |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Years. | Months. | Mathematics. | Physics and chemistry. | History and rhetoric. | French. | Drawing. |  | Months. | Days. |
| 27 | Andrews, Horace Burlingame | Michigan | June 22, 1876 | 15 | 1 | 26 | 44 | 36 | 10 | 28 | 56 | 2 | 0 |
| 41 | Ballentine, Henry Laird | Tennessee | June 20, 1877 | 16 | 6 | 53 | 42 | 7 | 25 | 68 | 202 | 2 | 0 |
| 30 | Barnett, George | Wisconsin | June 19, 1877 | 17 | 6 | 35 | 22 | 20 | 69 | 44 | 46 | 2 | 0 |
| 48 | Blow, George Preston | Virginia | Sept. 14, 1876 | 15 | 11 | 53 | 31 | 42 | 72 | 33 | 181 | 2 | 0 |
| 77 | Bonfils, Thomas Lewis | Missouri | June 19, 1875 | 17 | 8 | 76 | 68 | 63 | 75 | 67 | 127 | 2 | 16 |
| 50 | Bryan, Samuel | Maryland | June 14, 1876 | 17 | 3 | 57 | 36 | 40 | 35 | 49 | 130 | 2 | 0 |
| 40 | Buck, Guy Morville | Maine | Sept. 11, 1877 | 16 | 10 | 35 | 54 | 49 | 62 | 34 | 49 | 2 | 0 |
| 21 | Bunts, Frank Emory | Ohio | June 20, 1877 | 16 | 1 | 23 | 33 | 21 | 17 | 31 | 37 | 2 | 0 |
| 14 | Capehart, Edward Everett | Ohio | June 22, 1877 | 17 | 11 | 14 | 15 | 12 | 8 | 39 | 65 | 2 | 0 |
| 11 | Carroll, Eugene | At large | June 19, 1877 | 16 | 2 | 8 | 24 | 17 | 28 | 21 | 129 | 2 | 0 |
| 38 | Clarke, George | Illinois | June 22, 1877 | 14 | 11 | 27 | 35 | 56 | 51 | 58 | 202 | 2 | 0 |
| 44 | Cockle, Rudolphus Rouse | Illinois | June 21, 1875 | 17 | 8 | 42 | 44 | 30 | 49 | 37 | 214 | 2 | 0 |
| 60 | Cohen, Harry Radcliffe | At large | June 20, 1877 | 15 | 4 | 62 | 66 | 49 | 68 | 26 | 51 | 2 | 0 |
| 42 | Colwell, James Ham | At large | June 20, 1877 | 16 | 10 | 39 | 56 | 30 | 39 | 59 | 81 | 2 | 0 |
| 68 | Craig, Ben Holliday | Missouri | June 14, 1876 | 16 | 8 | 73 | 66 | 52 | 57 | 61 | 163 | 2 | 0 |
| 75 | Craven, Macdonough | New York | June 21, 1876 | 17 | 7 | 74 | 77 | 72 | 46 | 6 | 188 | 2 | 0 |
| 43 | Crenshaw, James Davis | Texas | Sept. 11, 1877 | 17 | 10 | 34 | 62 | 63 | 42 | 25 | 78 | 2 | 0 |
| 8 | Dashiell, Robert Brooke | At large | June 19, 1877 | 16 | 11 | 11 | 11 | 10 | 5 | 2 | 22 | 2 | 0 |
| 63 | Donnelly, Michael Joseph | Wisconsin | June 21, 1877 | 17 | 7 | 71 | 55 | 38 | 38 | 51 | 158 | 2 | 0 |
| 19 | Doyen, Charles Augustus | New Hampshire | June 21, 1876 | 16 | 9 | 24 | 18 | 15 | 11 | 34 | 139 | 2 | 0 |
| 54 | Dresser, James Walter | Minnesota | June 21, 1877 | 16 | 8 | 44 | 47 | 72 | 54 | 41 | 189 | 2 | 0 |
| 17 | Eldredge, Houston | At large | Oct. 2, 1876 | 15 | 7 | 21 | 27 | 9 | 13 | 46 | 63 | 2 | 0 |
| 74 | Emmet, William Le Roy | At large | June 26, 1876 | 16 | 11 | 59 | 21 | 65 | 79 | 10 | 236 | 2 | 0 |

## CADET-MIDSHIPMEN.

*Second class—79 members*—Continued.

| Order of annual merit. | Name. | State. | Date of admission. | Age at date of admission. | | Order of merit in— | | | | | Number of demerits. | Sea-service in practice-ships. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Years. | Months. | Mathematics. | Physics and chemistry. | History and rhetoric. | French. | Drawing. | | Months. | Days. |
| 78 | Enouye, Yonoske | Empire of Japan | Sept. 18, 1877 | 19 | 0 | 80 | 80 | 80 | ..... | 42 | 8 | 2 | 16 |
| 33 | Flournoy, William Francis | Louisiana | June 19, 1877 | 17 | 9 | 25 | 59 | 37 | 12 | 80 | 191 | 2 | 0 |
| 70 | Ford, William Griffing | Arkansas | Sept. 11, 1877 | 15 | 7 | 67 | 52 | 72 | 77 | 71 | 186 | 2 | 0 |
| 24 | Forshew, Robert Pierpont | New York | June 21, 1876 | 16 | 11 | 37 | 12 | 3 | 15 | 59 | 45 | 2 | 0 |
| 49 | George, Charles Peaslee | Illinois | July 1, 1876 | 16 | 3 | 48 | 70 | 46 | 44 | 16 | 112 | 2 | 0 |
| 32 | Gresham, William Albert | Indiana | June 19, 1875 | 17 | 3 | 30 | 44 | 52 | 51 | 18 | 52 | 2 | 16 |
| 22 | Haines, Henry Cargill | At large | June 26, 1875 | 15 | 7 | 18 | 29 | 29 | 39 | 9 | 165 | 2 | 0 |
| 39 | Hains, Robert Peter | Maine | Sept. 18, 1876 | 16 | 3 | 47 | 26 | 45 | 51 | 17 | 118 | 2 | 0 |
| 67 | Harmon, Eugene Marion | Ohio | June 20, 1877 | 17 | 10 | 70 | 64 | 43 | 62 | 48 | 240 | 2 | 0 |
| 46 | Harrison, Edward Hasson | At large | June 21, 1877 | 15 | 10 | 37 | 36 | 47 | 75 | 64 | 72 | 2 | 0 |
| 69 | Hasson, Alexander Ritchie | At large | June 21, 1875 | 15 | 4 | 78 | 42 | 49 | 60 | 14 | 169 | 2 | 16 |
| *6 | **Hoogewerff, John Adrian** | At large | June 21, 1877 | 16 | 7 | 7 | 4 | 14 | 22 | 15 | 71 | 2 | 0 |
| 26 | Hunicke, Felix Harmon | Missouri | Sept. 11, 1877 | 17 | 6 | 27 | 60 | 25 | 8 | 1 | 99 | 2 | 0 |
| 13 | Karmany, Lincoln | Pennsylvania | Sept. 12, 1877 | 17 | 0 | 15 | 9 | 19 | 4 | 29 | 79 | 2 | 0 |
| 31 | Kase, Spencer Mettler | Illinois | Sept. 11, 1877 | 17 | 10 | 29 | 56 | 41 | 22 | 31 | 69 | 2 | 0 |
| 37 | Kimball, John Arthur | Massachusetts | Sept. 12, 1877 | 17 | 0 | 45 | 18 | 59 | 31 | 30 | 121 | 2 | 0 |
| 16 | Lauchheimer, Charles Henry | Maryland | Sept. 11, 1877 | 17 | 11 | 17 | 14 | 33 | 6 | 56 | 127 | 2 | 0 |
| 73 | Lindsey, John Howard | Pennsylvania | June 21, 1876 | 16 | 2 | 67 | 74 | 79 | 62 | 63 | 214 | 2 | 0 |
| *4 | **Linnard, Joseph Hamilton** | Pennsylvania | June 21, 1877 | 16 | 9 | 5 | 1 | 13 | 20 | 22 | 153 | 2 | 0 |
| 25 | Mahoney, James Edward | Massachusetts | Sept. 12, 1876 | 16 | 9 | 40 | 22 | 2 | 13 | 34 | 113 | 2 | 0 |
| 65 | Matthews, Thomas Henry | Pennsylvania | Sept. 12, 1876 | 16 | 1 | 64 | 49 | 66 | 45 | 74 | 226 | 2 | 0 |
| 36 | McCrea, Alexander Sterling | At large | Oct. 2, 1876 | 17 | 2 | 50 | 47 | 25 | 7 | 11 | 186 | 2 | 0 |
| 57 | McJunkin, Ira | Pennsylvania | June 20, 1877 | 17 | 4 | 65 | 61 | 32 | 27 | 54 | 34 | 2 | 0 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 72 | McKee, Llewellyn Thomas | Pennsylvania | June 20, 1877 | 17 | 0 | 69 | 68 | 76 | 72 | 78 | 163 | 2 | 16 |
| 64 | Morgan, Daniel | Kentucky | Sept. 11, 1877 | 17 | 10 | 62 | 49 | 75 | 57 | 70 | 134 | 2 | 0 |
| 23 | Moses, Franklin James | South Carolina | Sept. 11, 1877 | 16 | 9 | 19 | 27 | 25 | 33 | 26 | 163 | 2 | 0 |
| 71 | Oliphant, Alexander Coulter | New Jersey | Sept. 12, 1877 | 17 | 5 | 72 | 78 | 69 | 74 | 50 | 62 | 2 | 0 |
| 62 | Orlopp, Max Anton | Arkansas | June 19, 1876 | 17 | 1 | 42 | 62 | 77 | 65 | 77 | 209 | 0 | 0 |
| 76 | Parker, Felton | Iowa | Nov. 6, 1876 | 16 | 0 | 79 | 79 | 61 | 3 | 6 | 228 | 2 | 0 |
| 59 | Parsons, Arthur Carlton | Iowa | June 21, 1876 | 17 | 11 | 50 | 49 | 68 | 65 | 47 | 122 | 2 | 0 |
| 12 | Perkins, Con Marrast | Georgia | Sept. 11, 1875 | 14 | 11 | 16 | 8 | 4 | 22 | 18 | 169 | 2 | 18 |
| 66 | Perry, George Ernest | Illinois | Sept. 12, 1876 | 16 | 10 | 58 | 64 | 67 | 65 | 76 | 147 | 2 | 16 |
| 20 | Pierce, Byron Gilmore | Illinois | June 21, 1877 | 17 | 4 | 21 | 17 | 10 | 55 | 42 | 126 | 2 | 0 |
| 45 | Printup, David Lawrence | New York | June 21, 1877 | 17 | 5 | 45 | 33 | 43 | 57 | 39 | 177 | 2 | 0 |
| *2 | **Rees, John Livermore** | Michigan | June 21, 1877 | 17 | 4 | 3 | 5 | 1 | 18 | 4 | 174 | 2 | 0 |
| *3 | **Rider, Frederick Clinton** | Rhode Island | Sept. 12, 1877 | 17 | 6 | 2 | 3 | 15 | 42 | 3 | 65 | 2 | 0 |
| 55 | Robinson, William Moody | At large | June 23, 1876 | 17 | 4 | 56 | 36 | 61 | 70 | 52 | 139 | 2 | 0 |
| 47 | Rodgers, Guy George | Tennessee | Sept. 23, 1876 | 14 | 1 | 31 | 56 | 58 | 36 | 79 | 158 | 2 | 0 |
| † | Rodman, Hugh | Kentucky | Sept. 13, 1875 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 5 | 4 |
| 56 | Russell, William Worthington | At large | Sept. 12, 1876 | 17 | 9 | 66 | 52 | 56 | 2 | 64 | 253 | 2 | 0 |
| *1 | **Schock, John Loomis** | Pennsylvania | June 19, 1877 | 17 | 4 | 1 | 1 | 4 | 28 | 5 | 110 | 2 | 0 |
| 9 | Serata, Tasuker | Empire of Japan | Sept. 12, 1877 | 19 | 0 | 6 | 20 | 33 | 32 | 53 | 43 | 2 | 0 |
| 28 | Smies, Frederick William | Ohio | June 22, 1877 | 16 | 6 | 31 | 25 | 28 | 34 | 6 | 85 | 2 | 0 |
| 15 | Stayton, William Henry | Delaware | June 21, 1877 | 16 | 3 | 12 | 9 | 17 | 36 | 57 | 231 | 2 | 0 |
| 35 | Stewart, Charles West | Illinois | June 21, 1877 | 17 | 10 | 53 | 15 | 47 | 15 | 23 | 123 | 2 | 0 |
| *7 | **Sutton, Francis Eskridge** | New York | June 21, 1877 | 16 | 6 | 9 | 7 | 6 | 1 | 61 | 57 | 2 | 0 |
| 18 | Uriu, Sotokichi | Empire of Japan | Sept. 12, 1877 | 19 | 0 | 13 | 73 | 23 | 25 | 20 | 29 | 2 | 0 |
| 51 | Vance, Zebulon Baird | North Carolina | June 22, 1876 | 16 | 0 | 40 | 31 | 71 | 60 | 73 | 228 | 2 | 18 |
| 52 | Weeks, John Wingate | New Hampshire | June 21, 1877 | 17 | 2 | 48 | 75 | 33 | 46 | 45 | 49 | 2 | 0 |
| 34 | Weller, Ovington Eugene | Maryland | Sept. 12, 1877 | 15 | 7 | 31 | 30 | 38 | 20 | 69 | 178 | 2 | 0 |
| 10 | White, Harry Kidder | Dakota | Sept. 19, 1877 | 17 | 6 | 10 | 12 | 21 | 18 | 13 | 43 | 2 | 0 |
| 58 | Wilkes, Gilbert | Utah | Sept. 12, 1877 | 14 | 0 | 59 | 39 | 52 | 50 | 38 | 164 | 2 | 0 |
| 61 | Williamson, Samuel Hill | North Carolina | Sept. 11, 1876 | 17 | 10 | 59 | 39 | 60 | 30 | 74 | 192 | 2 | 0 |
| 29 | Wilson, Henry Braid | New Jersey | Sept. 11, 1876 | 15 | 7 | 20 | 41 | 24 | 46 | 66 | 184 | 2 | 0 |
| *5 | **Woodward, Joseph Janvier** | At large | June 21, 1877 | 16 | 9 | 4 | 6 | 8 | 70 | 11 | 68 | 2 | 0 |
| 53 | Wright, Silas Haynes | Michigan | June 28, 1876 | 17 | 10 | 50 | 71 | 52 | 39 | 24 | 130 | 2 | 0 |

† Turned back from the first class.

## CADET-MIDSHIPMEN.

*Third class—52 members.*

| Order of annual merit. | Name. | State. | Date of admission. | Age at date of admission. |  | Order of merit in— |  |  |  | Number of demerits. | Sea-service in practice-ships. |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Years. | Months. | Mathematics. | English and history. | French. | Drawing. |  | Months. | Days. |
| 26 | Anderson, Edwin Alexander | North Carolina | June 21, 1878 | 17 | 11 | 40 | 17 | 11 | 9 | 97 | 2 | 16 |
| *2 | **Arnold, John Thompson** | Wyoming Territory | Sept. 27, 1877 | 17 | 10 | 2 | 8 | 27 | 5 | 193 | 2 | 16 |
| 50 | Ashby, Stephen | Kentucky | June 21, 1878 | 16 | 8 | 50 | 57 | 50 | 58 | 151 | 2 | 16 |
| 39 | Bell, Everett Nelson | Tennessee | Aug. 23, 1877 | 17 | 11 | 48 | 17 | 44 | 25 | 106 | 2 | 16 |
| *3 | **Bennett, Louis Slocum** | New Jersey | Sept. 11, 1877 | 15 | 9 | 6 | 2 | 9 | 26 | 177 | 2 | 16 |
| 38 | Blake, Robert Bunch | North Carolina | Sept. 11, 1877 | 16 | 7 | 42 | 39 | 1 | 49 | 239 | 2 | 16 |
| 30 | Blandin, John Joseph | Alabama | June 21, 1878 | 15 | 10 | 32 | 16 | 26 | 33 | 179 | 2 | 16 |
| 28 | Conway, John Joseph | New York | Sept. 11, 1877 | 17 | 10 | 31 | 9 | 23 | 53 | 146 | 2 | 16 |
| 44 | Dent, Sidney Hope | At Large | Sept. 11, 1876 | 15 | 7 | 47 | 41 | 56 | 12 | 89 | 2 | 16 |
| 20 | Doyle, James Gregory | Pennsylvania | June 21, 1877 | 17 | 1 | 19 | 27 | 33 | 3 | 163 | 2 | 16 |
| 29 | Dudley, Charles Jackson | Georgia | Sept. 11, 1877 | 17 | 0 | 24 | 42 | 23 | 31 | 158 | 2 | 16 |
| 51 | Duncan, William Butler | New York | Nov. 1, 1878 | 16 | 6 | 33 | 58 | 2 | 41 | 246 | 2 | 16 |
| 16 | Eames, Harold Hayden | Maine | June 21, 1878 | 14 | 6 | 20 | 23 | 19 | 6 | 165 | 2 | 16 |
| 11 | Field, Wiley Roy Mason | Virginia | June 21, 1878 | 15 | 8 | 8 | 30 | 6 | 35 | 101 | 2 | 16 |
| 4 | Fletcher, William Bartlett | Vermont | Sept. 11, 1877 | 15 | 8 | 9 | 3 | 30 | 2 | 103 | 2 | 16 |
| 41 | Fowler, Hammond | Virginia | Sept. 23, 1878 | 16 | 7 | 45 | 24 | 21 | 39 | 127 | 2 | 16 |
| 17 | Grambs, William Jacob | Pennsylvania | Sept. 11, 1877 | 15 | 5 | 12 | 31 | 40 | 21 | 243 | 2 | 16 |
| 37 | Gwyn, Lawrence Sangston | Mississippi | June 21, 1878 | 16 | 11 | 41 | 34 | 17 | 33 | 52 | 2 | 16 |
| 41 | Hayden, Thomas Warren | Massachusetts | Sept. 11, 1877 | 16 | 8 | 37 | 46 | 12 | 53 | 224 | 2 | 16 |
| 45 | Hoke, William Peyton | Kentucky | Sept. 11, 1877 | 16 | 4 | 44 | 25 | 30 | 59 | 276 | 2 | 16 |
| 22 | Horst, Henry August | Alabama | June 21, 1878 | 17 | 5 | 29 | 17 | 3 | 23 | 74 | 2 | 16 |
| 9 | Howard, William Lauriston | Connecticut | Sept. 11, 1877 | 17 | 8 | 11 | 9 | 4 | 15 | 73 | 2 | 16 |
| 35 | Hubbard, Nathaniel Mead | At large | Sept. 11, 1877 | 17 | 6 | 28 | 38 | 48 | [illegible]8 | 249 | 2 | 16 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | Jayne, Joseph Lee | Mississippi | June 21, 1878 | 15 | 1 | 17 | 33 | 50 | 21 | 119 | 2 | 16 |
| 18 | Johnston, Marbury | Georgia | Sept. 23, 1878 | 17 | 9 | 16 | 15 | 14 | 45 | 122 | 2 | 16 |
| 19 | Kenkel, Herman Henry | Minnesota | June 21, 1878 | 17 | 5 | 15 | 42 | 32 | 1 | 51 | 2 | 16 |
| 34 | Kent, George Edward | New York | June 21, 1877 | 16 | 10 | 26 | 44 | 41 | 19 | 233 | 2 | 16 |
| 12 | Key, Albert Lenoir | Tennessee | June 21, 1877 | 16 | 11 | 7 | 9 | 15 | 50 | 266 | 2 | 16 |
| † | King, William Nephew, jr | Georgia | June 21, 1875 | 17 | 5 | | | | | | 0 | 0 |
| 32 | Lamkin, John Alcus | Mississippi | June 21, 1877 | 17 | 5 | 27 | 23 | 35 | 56 | 169 | 2 | 16 |
| 48 | Lodeman, Frank Felix Emile | Michigan | June 21, 1878 | 14 | 4 | 49 | 46 | 15 | 40 | 234 | 2 | 16 |
| 13 | Martin, Clarence | Louisiana | June 21, 1878 | 16 | 3 | 10 | 22 | 10 | 48 | 78 | 2 | 16 |
| 36 | McGiffen, Philo Norton | Pennsylvania | Sept. 11, 1877 | 16 | 9 | 30 | 32 | 41 | 29 | 234 | 2 | 16 |
| 7 | McNutt, Finley Alexander | Indiana | Sept. 11, 1877 | 16 | 9 | 13 | 1 | 6 | 44 | 225 | 2 | 16 |
| 7 | McWhorter, Jacob Gray | Georgia | Sept. 12, 1877 | 16 | 2 | 4 | 13 | 20 | 37 | 213 | 2 | 16 |
| 31 | Miner, John Rice | Ohio | June 21, 1876 | 15 | 10 | 38 | 14 | 34 | 18 | 227 | 2 | 16 |
| 43 | Morris, Walter Ellis | Pennsylvania | June 20, 1877 | 16 | 6 | 46 | 49 | 50 | 4 | 133 | 2 | 16 |
| *1 | **Nixon, Lewis** | Virginia | June 21, 1878 | 17 | 2 | 1 | 4 | 12 | 19 | 62 | 2 | 16 |
| 47 | Norton, Oliver Dwight | Ohio | June 21, 1877 | 17 | 11 | 43 | 46 | 50 | 38 | 108 | 2 | 16 |
| 5 | Paine, Walter Taylor | Ohio | Sept. 11, 1877 | 14 | 11 | 3 | 21 | 8 | 51 | 80 | 2 | 16 |
| 46 | Patterson, Samuel Achmuty Wainwright | At large | June 21, 1876 | 16 | 6 | 35 | 44 | 38 | 55 | 263 | 2 | 16 |
| 6 | Poyer, John Martin | At large | June 21, 1877 | 15 | 9 | 5 | 5 | 29 | 35 | 241 | 2 | 16 |
| 27 | Prince, Thomas Clayton | Ohio | June 21, 1878 | 17 | 9 | 33 | 27 | 38 | 13 | 67 | 2 | 16 |
| 33 | Savage, Ledru Rollin | Illinois | Sept. 23, 1878 | 17 | 2 | 39 | 27 | 36 | 26 | 40 | 2 | 16 |
| 21 | Semple, Lorenzo | Alabama | Sept. 11, 1877 | 16 | 0 | 22 | 12 | 4 | 45 | 216 | 2 | 16 |
| 49 | Schrader, George Morrison von | Missouri | Sept. 23, 1878 | 16 | 5 | 51 | 55 | 49 | 43 | 135 | 2 | 16 |
| 14 | Slack, William Yarnall | Missouri | June 19, 1877 | 16 | 11 | 17 | 20 | 23 | 15 | 36 | 2 | 16 |
| 42 | Smythe, James Wilson | New York | June 19, 1877 | 16 | 5 | 36 | 50 | 37 | 30 | 149 | 2 | 16 |
| 15 | Stahle, Frederick Henry | California | Sept. 11, 1877 | 15 | 4 | 21 | 7 | 18 | 28 | 236 | 2 | 16 |
| 24 | Sutphen, Edson Webster | Nebraska | June 21, 1878 | 17 | 9 | 23 | 25 | 44 | 7 | 114 | 2 | 16 |
| 25 | Whittelsey, William Bailey | New York | June 21, 1878 | 17 | 11 | 24 | 37 | 41 | 11 | 40 | 2 | 16 |
| 10 | Wood, Spencer Shepard | New York | June 21, 1878 | 16 | 10 | 14 | 6 | 22 | 10 | 34 | 2 | 16 |

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†In accordance with an act of Congress approved June, 1879.

## CADET-MIDSHIPMEN.

### *Fourth class—61 members.*

| Name. | State. | Date of admission. | Age at date of admission. | |
|---|---|---|---|---|
| | | | Yrs. | Mos. |
| Agee, Alfred Pelham | Alabama | June 11, 1879 | 16 | 10 |
| Alexander, Robert Colder | Kentucky | Sept. 22, 1879 | 16 | 2 |
| Balthis, Harry Hamilton | Illinois | June 11, 1879 | 17 | 8 |
| Barnard, John Hall | New York | Sept. 23, 1878 | 17 | 2 |
| Belford, Samuel Elmore | Pennsylvania | Sept. 23, 1878 | 17 | 5 |
| Bowman, William Ezekiel | Michigan | Sept. 22, 1879 | 16 | 3 |
| Brady, Cyrus Townsend | Kansas | Sept. 22, 1879 | 17 | 9 |
| Carpenter, James Franklin | Indiana | Sept. 12, 1878 | 15 | 7 |
| Cassidy, Edward Rochfort | New York | Sept. 12, 1879 | 17 | 11 |
| Chapin, Frederick Lincoln | Illinois | Sept. 22, 1879 | 16 | 3 |
| Colvin, Frank Reginald | New York | Sept. 22, 1879 | 17 | 2 |
| Cooper, James Jackson Gignilliat | Florida | Sept. 22, 1879 | 16 | 7 |
| Dalrymple, Elton Wesley | Iowa | June 21, 1878 | 16 | 4 |
| Dovalé, Arthur | New York | Sept. 23, 1878 | 17 | 10 |
| Frazier, Robert Thomas | Tennessee | Sept. 23, 1879 | 16 | 4 |
| George, Harry | Michigan | June 11, 1879 | 16 | 1 |
| Gignilliat, Thomas Heywood | Georgia | Sept. 23, 1878 | 15 | 7 |
| Gray, Willie Theodore | North Carolina | May 8, 1878 | 18 | 0 |
| Greene, Samuel Dana, jr | Rhode Island | June 18, 1879 | 14 | 7 |
| Hepp, Charles Frederick | Missouri | June 21, 1878 | 17 | 2 |
| Jackson, John Alexander | Florida | Sept. 22, 1879 | 17 | 11 |
| Jackson, John Brinckerhoff | New Jersey | Sept. 22, 1879 | 17 | 1 |
| Jastremski, Leon Henry | Louisiana | Sept. 22, 1879 | 14 | 11 |
| Keith, Albion Sherman | Massachusetts | Sept. 22, 1879 | 16 | 5 |
| Kiefer, Edmund Emerson | Pennsylvania | June 11, 1879 | 16 | 4 |
| Ledbetter, William Hamilton | Texas | Sept. 22, 1879 | 17 | 8 |
| Legaré, Alexander Brown | South Carolina | Mar. 20, 1878 | 18 | 0 |
| Lennon, Michael Edward | Wisconsin | Sept. 22, 1879 | 16 | 10 |
| Lerch, Robert Lee | Ohio | Sept. 22, 1879 | 16 | 3 |
| Lorenskiold, Arlington Lee | Texas | Sept. 22, 1879 | 16 | 10 |
| McCook, John Anson | New York | Sept. 22, 1879 | 16 | 2 |
| McCreary, Wirt | Pennsylvania | June 11, 1879 | 17 | 1 |
| McIntire, Alonzo Evans | Massachusetts | Sept. 22, 1879 | 15 | 0 |
| McKean, Josiah Slutts | Ohio | Sept. 22, 1879 | 15 | 3 |
| Megrath, William Alonzo | Georgia | Sept. 22, 1879 | 17 | 4 |
| Mitchell, Charles Ryan | Georgia | Sept. 22, 1879 | 17 | 9 |
| Mitchell, Sidney Zollicoffer | Alabama | Sept. 23, 1878 | 16 | 6 |
| Morris, John Knox | Indiana | Sept. 23, 1878 | 17 | 5 |
| O'Leary, Timothy Stephen | Massachusetts | Sept. 22, 1879 | 18 | 0 |
| Parker, Foxhall Alexander | Iowa | Sept. 22, 1879 | 17 | 3 |
| Pefley, Harlem | Idaho Territory | Sept. 22, 1879 | 17 | 11 |
| Pettit, Harry Corbin | Indiana | Sept. 22, 1879 | 15 | 10 |
| Philbin, Patrick Henry | Maryland | June 21, 1878 | 17 | 8 |
| Plunkett, Charles Peshall | District of Columbia | Sept. 30, 1879 | 15 | 7 |
| Rankin, Harry | Kansas | June 21, 1878 | 15 | 4 |
| Reynolds, Charles Roberts | Arizona Territory | June 21, 1878 | 15 | 6 |
| Ricketts, William Wallace | Virginia | Sept. 23, 1878 | 17 | 10 |
| Salisbury, Smith | New York | Sept. 23, 1878 | 16 | 8 |
| Smith, Thomas Buchanan | Alabama | June 21, 1878 | 17 | 8 |

## CADET-MIDSHIPMEN.

*Fourth class*--61 *members*—Continued.

| Name. | State. | Date of admission. | Age at date of admission. | |
|---|---|---|---|---|
| | | | Yrs. | Mos. |
| Solomon, Edward Everett | Georgia | Sept. 17, 1878 | 18 | 0 |
| Stout, George Clymer | Pennsylvania | Sept. 22, 1879 | 17 | 2 |
| Street, George Washington | Wisconsin | Sept. 22, 1879 | 16 | 7 |
| Sweeting, Charles Edward | New York | Sept. 22, 1879 | 17 | 11 |
| Temple, Edwin George | Wisconsin | Sept. 22, 1879 | 17 | 8 |
| Thurston, Benjamin Eaton | Indiana | Sept. 22, 1879 | 15 | 5 |
| Toney, Tremlet Vivian | Illinois | June 11, 1879 | 17 | 8 |
| Weeks, Edwin Babbitt | Oregon | Sept. 23, 1878 | 15 | 3 |
| Wentworth, Louis Miller | New York | Sept. 22, 1879 | 16 | 10 |
| Wilson, William Joseph | Ohio | Sept. 22, 1879 | 17 | 11 |
| Witherspoon, Thomas Alfred | Tennessee | June 11, 1879 | 17 | 2 |
| Woods, Robert Harris | Virginia | Sept. 23, 1878 | 17 | 10 |

## CADET-ENGINEERS.

*Graduating class of* 1879—23 *members.*

| Order of general merit. | Name. | State. | Date of admission. | Age at date of admission. |  | Order of merit in— |  |  |  |  |  |  |  | Number of demerits. | Sea-service in practice-ships. |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Years. | Months. | Naval construction. | Steam-engineering. | Light and heat. | Physical measurements. | Mechanics. | Naval architecture. | Law. | Spanish. |  | Months. | Days. |
| *1 | **Gatewood, Richard** | Virginia | Sept. 15, 1875 | 15 | 11 | 3 | 1 | 3 | 13 | 2 | 1 | 1 | 2 | 47 | 2 | 21 |
| *2 | **McFarland, Walter Martin** | District of Columbia | Sept. 15, 1875 | 16 | 1 | 9 | 3 | 1 | 8 | 3 | 2 | 5 | 1 | 54 | 5 | 20 |
| *3 | **Bowles, Francis Tiffany** | Massachusetts | Sept. 15, 1875 | 16 | 11 | 2 | 2 | 4 | 8 | 4 | 3 | 2 | 7 | 53 | 5 | 20 |
| 4 | Bryan, Benjamin Chambers | New Jersey | Sept. 15, 1875 | 17 | 1 | 7 | 3 | 6 | 1 | 1 | 5 | 6 | 5 | 58 | 5 | 20 |
| 5 | Lubbe, Charles Bethel | Pennsylvania | Sept. 15, 1875 | 18 | 3 | 3 | 5 | 7 | 1 | 7 | 4 | 11 | 6 | 66 | 5 | 20 |
| 6 | Carr, Clarence Alfred | Pennsylvania | Sept. 15, 1875 | 19 | 1 | 14 | 8 | 5 | 13 | 5 | 6 | 10 | 4 | 56 | 5 | 20 |
| 7 | Hunt, Andrew Murray | Indiana | Sept. 15, 1875 | 16 | 2 | 12 | 6 | 8 | 1 | 18 | 7 | 11 | 3 | 47 | 5 | 20 |
| 8 | Acker, Edward O'Connor | Pennsylvania | Sept. 15, 1875 | 17 | 4 | 6 | 7 | 2 | 1 | 13 | 9 | 3 | 14 | 29 | 5 | 20 |
| 9 | Annan, John Wesley | Massachusetts | Sept. 15, 1875 | 19 | 0 | 17 | 9 | 9 | 6 | 12 | 21 | 15 | 9 | 118 | 5 | 20 |
| 10 | Ivers, Henry King | Missouri | Oct. 1, 1874 | 18 | 6 | 14 | 15 | 11 | 11 | 9 | 8 | 17 | 12 | 95 | 4 | 27 |
| 11 | Norton, Harold Percival | New York | Oct. 1, 1874 | 18 | 10 | 1 | 11 | 16 | 13 | 8 | 20 | 8 | 20 | 43 | 5 | 20 |
| 12 | Bennett, Frank Marion | Michigan | Oct. 1, 1874 | 17 | 5 | 22 | 17 | 22 | 13 | 15 | 11 | 4 | 20 | 81 | 5 | 20 |
| 13 | Elseffer, Harry Smith | Iowa | Oct. 1, 1874 | 19 | 3 | 20 | 14 | 19 | 5 | 23 | 19 | 20 | 10 | 44 | 5 | 20 |
| 14 | Talcott, Charles Gratiot | Virginia | Sept. 15, 1875 | 16 | 0 | 10 | 10 | 14 | 6 | 21 | 15 | 18 | 16 | 97 | 5 | 20 |
| 15 | Crygier, John Ulysses | New York | Oct. 1, 1874 | 16 | 6 | 5 | 12 | 12 | 19 | 19 | 18 | 6 | 12 | 55 | 5 | 20 |
| 16 | Isbester, Richard Thornton | Tennessee | Sept. 15, 1875 | 18 | 3 | 12 | 20 | 10 | 8 | 6 | 10 | 11 | 15 | 101 | 5 | 20 |
| 17 | Scribner, Edward Hershel | Massachusetts | Oct. 1, 1874 | 19 | 11 | 10 | 13 | 17 | 13 | 17 | 23 | 22 | 19 | 62 | 5 | 20 |
| 18 | Bevington, Martin | Ohio | Sept. 15, 1875 | 17 | 10 | 8 | 16 | 15 | 13 | 14 | 16 | 8 | 23 | 72 | 5 | 20 |
| 19 | Bowers, Frederic Clay | New Jersey | Sept. 15, 1875 | 17 | 7 | 19 | 18 | 13 | 20 | 9 | 11 | 16 | 8 | 91 | 5 | 20 |
| 20 | Salisbury, George Robert | Missouri | Oct. 1, 1874 | 19 | 7 | 16 | 23 | 23 | 12 | 22 | 13 | 23 | 11 | 45 | 5 | 20 |
| 21 | Pickrell, Joseph McCall | Virginia | Oct. 1, 1874 | 17 | 2 | 21 | 19 | 17 | 20 | 9 | 13 | 19 | 18 | 116 | 2 | 9 |
| 22 | Baker, John Howard | Rhode Island | Sept. 15, 1875 | 18 | 0 | 23 | 22 | 21 | 22 | 16 | 17 | 21 | 22 | 96 | 5 | 20 |
| 23 | Carter, Thomas Frederic | Kentucky | Oct. 1, 1873 | 18 | 3 | 18 | 21 | 20 | 22 | 19 | 22 | 11 | 17 | 51 | 5 | 20 |

## CADET-ENGINEERS.

*First class—18 members.*

| Order of annual merit. | Name. | State. | Date of admission. | Age at date of admission. | | Order of merit in— | | | | | | Number of demerits. | Sea-service in practice-ships. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Years. | Months. | Steam-engineering. | Astronomy. | Electricity. | Mechanics and applied mathematics. | Composition. | French. | | Months. | Days. |
| 8 | Allderdice, William Hillary | Pennsylvania | Sept. 14, 1876 | 16 | 9 | 10 | 14 | 17 | 6 | 1 | 12 | 191 | 5 | 4 |
| *2 | **Durand, William Frederick** | Connecticut | Sept. 14, 1876 | 17 | 6 | 2 | 2 | 2 | 1 | 4 | 4 | 101 | 5 | 4 |
| 14 | Hall, Harry | Pennsylvania | Sept. 14, 1876 | 17 | 9 | 15 | 10 | 8 | 12 | 10 | 14 | 34 | 5 | 4 |
| 3 | Hasson, William Frederick Converse | Ohio | Sept. 14, 1876 | 19 | 4 | 6 | 4 | 7 | 2 | 5 | 3 | 141 | 5 | 4 |
| 12 | King, Charles Alfred | Maryland | Sept. 14, 1876 | 18 | 1 | 12 | 12 | 10 | 9 | 6 | 13 | 117 | 5 | 4 |
| 13 | Kinkaid, Thomas Wright | Ohio | Sept. 14, 1876 | 16 | 6 | 13 | 13 | 5 | 15 | 8 | 8 | 48 | 5 | 4 |
| 9 | Manning, Charles Edward | New York | Sept. 14, 1876 | 17 | 6 | 8 | 6 | 5 | 14 | 3 | 18 | 71 | 5 | 4 |
| 15 | Mathews, Clarence Herbert | Ohio | Sept. 14, 1876 | 19 | 7 | 14 | 11 | 12 | 11 | 13 | 22 | 89 | 5 | 4 |
| 4 | Miner, Leo Dwight | Ohio | Sept. 14, 1876 | 17 | 7 | 3 | 5 | 3 | 4 | 19 | 20 | 21 | 5 | 4 |
| 5 | Sample, Winfield Scott | Pennsylvania | Sept. 14, 1876 | 18 | 10 | 5 | 8 | 9 | 5 | 17 | 15 | 77 | 5 | 4 |
| 11 | Smith, Albert Edward | Wisconsin | Sept. 14, 1876 | 17 | 8 | 7 | 7 | 12 | 13 | 8 | 16 | 127 | 5 | 4 |
| 18 | Smith, William Strother | Virginia | Sept. 15, 1875 | 18 | 0 | 20 | 19 | 11 | 16 | 20 | 11 | 126 | 5 | 6 |
| *1 | **Stahl, Albert William** | New York | Sept. 14, 1876 | 19 | 4 | 1 | 1 | 1 | 3 | 2 | 2 | 122 | 5 | 4 |
| 17 | Weaver, William Dixon | Pennsylvania | Sept. 14, 1876 | 19 | 1 | 16 | 17 | 14 | 18 | 6 | 9 | 207 | 5 | 4 |
| 7 | Wood, Joseph Learned | Virginia | Sept. 14, 1876 | 20 | 2 | 11 | 14 | 4 | 7 | 15 | 1 | 71 | 5 | 4 |
| 6 | Woods, Arthur Tannatt | Massachusetts | Sept. 14, 1876 | 17 | 7 | 4 | 3 | 15 | 8 | 12 | 5 | 104 | 5 | 4 |
| 16 | Worthington, John Leeds | Maryland | Sept. 14, 1876 | 18 | 3 | 19 | 18 | 19 | 17 | 10 | 7 | 42 | 5 | 4 |
| 10 | Young, Albert Osborn | New York | Sept. 14, 1876 | 19 | 2 | 9 | 9 | 16 | 10 | 15 | 6 | 60 | 5 | 4 |

## CADET-ENGINEERS.

*Second class—27 members.*

| Order of annual merit. | Name. | State. | Date of admission. | Age at date of admission. | | Order of merit in— | | | | | Number of demerits. | Sea-service in practice-ships. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Years. | Months. | Mathematics. | Physics and chemistry. | History and rhetoric. | French. | Mechanical drawing. | | Months. | Days. |
| 20 | Anderson, Martin Augustus | Wisconsin | Sept. 13, 1877 | 19 | 11 | 16 | 22 | 19 | 7 | 2 | 160 | 3 | 0 |
| 17 | Arnold, Solon | Maryland | Sept. 14, 1876 | 22 | 2 | 22 | 18 | 4 | 5 | 24 | 98 | 3 | 0 |
| 5 | Bankson, Lloyd | Pennsylvania | Sept. 13, 1877 | 19 | 9 | 5 | 2 | 13 | 11 | 12 | 98 | 3 | 0 |
| 24 | Beach, Robert James | New York | Sept. 13, 1877 | 19 | 10 | 23 | 24 | 16 | 24 | 4 | 171 | 3 | 0 |
| † | Belden, Charles Emery | Ohio | Sept. 14, 1876 | 18 | 6 | ...... | ...... | ...... | ...... | ...... | 57 | 2 | 18 |
| 19 | Bush, Arthur Richmond | Massachusetts | Sept. 13, 1877 | 17 | 4 | 14 | 13 | 26 | 14 | 3 | 213 | 3 | 0 |
| 7 | Byrne, James Edwin | Massachusetts | Sept. 14, 1876 | 19 | 5 | 6 | 3 | 18 | 17 | 9 | 143 | 3 | 0 |
| 6 | Dowst, Frank Butland | Massachusetts | Sept. 13, 1877 | 18 | 3 | 14 | 4 | 8 | 4 | 14 | 140 | 3 | 0 |
| 16 | Eckel, Herman | Ohio | Sept. 14, 1876 | 20 | 2 | 24 | 8 | 5 | 2 | 27 | 44 | 3 | 0 |
| 22 | Gartley, William Henry | Pennsylvania | Sept. 13, 1877 | 18 | 1 | 18 | 18 | 17 | 14 | 11 | 171 | 3 | 0 |
| † | Hogan, Thomas Joseph | Georgia | Oct. 1, 1874 | 18 | 10 | ...... | ...... | ...... | ...... | ..... | 140 | 5 | 6 |
| 1 | Kaemmerling, Gustave | Indiana | Sept. 13, 1877 | 19 | 3 | 2 | 5 | 9 | 9 | 6 | 100 | 3 | 0 |
| 14 | Lang, William | New York | Sept. 14, 1876 | 18 | 8 | 17 | 17 | 3 | 7 | 19 | 87 | 0 | 0 |
| 25 | McAllister, Andrew | New York | Sept. 13, 1877 | 19 | 3 | 25 | 26 | 7 | 18 | 20 | 127 | 3 | 0 |
| 10 | McAlpine, Kenneth | Virginia | Sept. 13, 1877 | 17 | 0 | 10 | 20 | 10 | 3 | 17 | 132 | 3 | 0 |
| 23 | Moritz, Albert | New York | Sept. 13, 1877 | 17 | 2 | 21 | 24 | 25 | 10 | 18 | 81 | 3 | 0 |
| 8 | Parsons, Isaac Brown | Michigan | Sept. 13, 1877 | 17 | 8 | 4 | 9 | 23 | 25 | 1 | 177 | 3 | 0 |
| 13 | Perkins, Lyman Burnham | Connecticut | Sept. 13, 1877 | 18 | 7 | 13 | 7 | 20 | 20 | 7 | 148 | 3 | 0 |
| 15 | Redgrave, De Witt Clinton | Maryland | Sept. 13, 1877 | 19 | 2 | 12 | 12 | 21 | 19 | 10 | 96 | 3 | 0 |
| 9 | Sampson, Bias Clay | Illinois | Sept. 13, 1877 | 19 | 6 | 3 | 20 | 15 | 21 | 21 | 118 | 3 | 0 |
| 3 | Shallenberger, Oliver Blackburn | Pennsylvania | Sept. 13, 1877 | 17 | 4 | 6 | 1 | 13 | 12 | 8 | 106 | 3 | 0 |
| 21 | Smith, William Stuart | New York | Sept. 13, 1877 | 19 | 8 | 19 | 16 | 10 | 26 | 5 | 101 | 3 | 0 |
| 12 | Stewart, jr., Robert | Michigan | Sept. 13, 1877 | 19 | 5 | 19 | 10 | 1 | 6 | 26 | 84 | 3 | 0 |
| 11 | Webster, William Townsend | New York | Sept. 13, 1877 | 20 | 1 | 8 | 15 | 12 | 14 | 15 | 131 | 3 | 0 |
| 18 | White, William Wilmot | Pennsylvania | Sept. 13, 1877 | 17 | 11 | 9 | 14 | 21 | 22 | 23 | 147 | 3 | 0 |
| 2 | Whitham, Jay Manuel | Illinois | Sept. 13, 1877 | 19 | 0 | 1 | 10 | 6 | 22 | 22 | 53 | 3 | 0 |
| 4 | Whittle, Llewellyn Fairfax | Virginia | Sept. 13, 1877 | 18 | 9 | 11 | 6 | 2 | 1 | 16 | 187 | 3 | 0 |

† Turned back from the first class.

## CADET-ENGINEERS.

### *Third class—29 members.*

| Order of annual merit. | Name. | State. | Date of admission. | Age at date of admission. | | Order of merit in— | | | | | Sea-service in practice-ships. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Years. | Months. | Mathematics. | English and history. | French. | Mechanical drawing. | Number of demerits. | Months. | Days. |
| 22 | Addicks, Walter Robarts | Penn. | Oct. 1, 1878 | 17 | 5 | 24 | 16 | 23 | 11 | 120 | 2 | 16 |
| 5 | Chambers, William Henry | Penn. | Oct. 1, 1878 | 19 | 11 | 8 | 3 | 11 | 17 | 85 | 2 | 16 |
| 7 | Clarke, Arthur Henry | R. I. | Oct. 1, 1878 | 18 | 1 | 7 | 5 | 6 | 28 | 99 | 2 | 16 |
| 24 | Coley, Frederick Edward | N. Y. | Oct. 1, 1878 | 16 | 8 | 22 | 24 | 25 | 7 | 221 | 2 | 16 |
| 11 | Conant, Frank Henry | Mass. | Oct. 1, 1878 | 19 | 5 | 12 | 9 | 14 | 21 | 79 | 2 | 16 |
| *2 | **Creighton, William Henry Paul** | Ohio | Oct. 1, 1878 | 19 | 2 | 1 | 2 | 4 | 15 | 72 | 2 | 16 |
| † | Day, Willis Bunner | Ohio | Sept. 13, 1877 | 19 | 10 | .... | .... | .... | .... | 97 | 3 | 0 |
| 9 | Ferguson, George Robert | Conn. | Oct. 1, 1878 | 19 | 3 | 5 | 17 | 19 | 3 | 50 | 2 | 16 |
| *3 | **Fitts, James Henry** | Va. | Oct. 1, 1878 | 17 | 7 | 6 | 4 | 2 | 19 | 76 | 2 | 16 |
| *4 | **Gatewood, Robert Woodland** | Va | Oct. 1, 1878 | 16 | 9 | 2 | 12 | 3 | 21 | 154 | 2 | 16 |
| 23 | Gladstone, Daniel Demarest | N. J | Sept. 13, 1877 | 18 | 1 | 20 | 19 | 13 | 11 | 259 | 2 | 16 |
| 15 | Gsantner, Otto Charles | N. J | Oct. 1, 1878 | 19 | 0 | 15 | 18 | 7 | 4 | 224 | 2 | 16 |
| 8 | Hawthorne, Harry Leroy | Ky | Oct. 1, 1878 | 19 | 9 | 9 | 6 | 18 | 5 | 92 | 2 | 16 |
| 13 | Higgins, Robert Barnard | Md | Oct. 1, 1878 | 20 | 0 | 13 | 19 | 8 | 14 | 118 | 2 | 16 |
| 14 | Howland, Charles Henry | R. I. | Oct. 1, 1878 | 17 | 5 | 17 | 7 | 14 | 23 | 116 | 2 | 16 |
| 17 | Leonard, John Calvin | Ohio | Oct. 1, 1878 | 19 | 3 | 15 | 13 | 17 | 26 | 108 | 2 | 16 |
| 25 | Leopold, Harry Girard | Ohio | Oct. 1, 1878 | 19 | 6 | 24 | 23 | 27 | 8 | 234 | 2 | 16 |
| 6 | Miller, Peter | Kans. | Oct. 1, 1878 | 18 | 7 | 4 | 8 | 10 | 24 | 109 | 2 | 16 |
| 12 | Pendleton, Joseph Henry | Penn. | Oct. 1, 1878 | 18 | 3 | 11 | 15 | 20 | 20 | 151 | 2 | 16 |
| 16 | Prevear, Herbert Pranker | Mass. | Sept 13, 1877 | 19 | 8 | 18 | 22 | 5 | 1 | 162 | 2 | 16 |
| 19 | Quinby, Isaac Henry | N. Y. | Oct. 1, 1878 | 17 | 7 | 14 | 25 | 16 | 11 | 274 | 2 | 16 |
| 10 | Rommell, Charles Edward | Penn. | Oct. 1, 1878 | 16 | 2 | 10 | 10 | 12 | 6 | 46 | 2 | 16 |
| 27 | Shock, Thomas Alexander Wharton | Md | Oct. 1, 1878 | 18 | 4 | 27 | 27 | 23 | 27 | 54 | 2 | 16 |
| 21 | Simpson, Henry Lakin | Penn. | Oct. 1, 1878 | 17 | 3 | 19 | 21 | 25 | 8 | 114 | 2 | 16 |
| 26 | Taylor, Edward Kenyon | Mass. | Oct. 1, 1878 | 18 | 8 | 26 | 26 | 20 | 15 | 104 | 2 | 16 |
| *1 | **Theiss, Emil** | Wis | Oct. 1, 1878 | 17 | 11 | 3 | 1 | 1 | 10 | 154 | 2 | 16 |
| 18 | Willis, Clarence Calhoun | Miss. | Oct. 1, 1878 | 19 | 0 | 21 | 11 | 9 | 25 | 84 | 2 | 16 |
| 20 | Winchell, Ward Philo | Ohio | Oct. 1, 1878 | 19 | 5 | 23 | 14 | 20 | 2 | 61 | 2 | 16 |
| 28 | Youchi, Sadanori | Japan | Sept. 21, 1878 | 19 | 11 | 28 | 28 | ... | 18 | 11 | 2 | 16 |

†Turned back from the second class.

## CADET-ENGINEERS.

*Fourth class—25 members.*

| Name. | State. | Date of appointment. | Age at date of examination. |  | Relative standing as determined at examination for appointment. |
|---|---|---|---|---|---|
|  |  |  | Years. | Months. |  |
| Alldrich, William Sleeper | New Jersey | Oct. 1, 1879 | 16 | 6 | 17 |
| Armistead, Samuel Wilson | Virginia | Oct. 1, 1879 | 18 | 0 | 5 |
| Barnes, Charles Edwin | New Jersey | Oct. 1, 1879 | 17 | 8 | 4 |
| Baxter, William Joseph | Ohio | Oct. 1, 1879 | 20 | 11 | 11 |
| Carswell, William Beggs | Delaware | Oct. 1, 1879 | 18 | 10 | 2 |
| Darrah, William Francis | Rhode Island | Oct. 1, 1879 | 17 | 1 | 16 |
| Duvall, Marius, jr | Maryland | Oct. 1, 1879 | 20 | 3 | 20 |
| Dyson, Charles Wilson | Pennsylvania | Oct. 1, 1879 | 17 | 9 | 6 |
| Eaton, Charles Phillips | Wisconsin | Oct. 1, 1879 | 16 | 4 | 23 |
| Ellenger, Julius | Maryland | Oct. 1, 1879 | 16 | 11 | 13 |
| Ellicott, John Morris | Maryland | Oct. 1, 1879 | 20 | 0 | 3 |
| Field, Harry Ashby | Virginia | Oct. 1, 1879 | 17 | 2 | 18 |
| Gillis, Harry Alexander | Pennsylvania | Oct. 1, 1879 | 17 | 9 | 10 |
| Glasscock, Eustace Straughn | Maryland | Oct. 1, 1879 | 16 | 6 | 25 |
| Gross, Charles Jacob | Maryland | Oct. 1, 1879 | 17 | 11 | 9 |
| Halstead, Alexander Seaman | Pennsylvania | Oct. 1, 1879 | 17 | 9 | 19 |
| Herbert, William Cromwell | Pennsylvania | Oct. 1, 1879 | 15 | 6 | 14 |
| Lawrance, William Hunter | Pennsylvania | Oct. 1, 1879 | 20 | 11 | 24 |
| Littlehales, George Washington | Pennsylvania | Oct. 1, 1879 | 18 | 11 | 8 |
| Palmer, James Edward | North Carolina | Oct. 1, 1879 | 18 | 3 | 22 |
| Pattison, Thomas Putnam | Maryland | Oct. 1, 1879 | 19 | 6 | 7 |
| Ryan, Philip Joseph | New York | Oct. 1, 1879 | 19 | 11 | 15 |
| Webster, Charles Franklin | Pennsylvania | Oct. 1, 1879 | 17 | 8 | 12 |
| Woodruff, Charles Edward | Pennsylvania | Oct. 1, 1879 | 18 | 11 | 1 |
| Zinnell, George Frederick | Pennsylvania | Oct. 1, 1879 | 17 | 11 | 21 |

## SUMMARY.

*October* 1, 1879.

### CADET-MIDSHIPMEN.

|  |  |  |
|---|---|---|
| First class | 61 members. |  |
| Second class | 79 members. |  |
| Third class | 52 members. |  |
| Fourth class | 61 members. |  |
|  |  | 253 |

### CADET-ENGINEERS.

|  |  |  |
|---|---|---|
| First class | 18 members. |  |
| Second class | 27 members. |  |
| Third class | 29 members. |  |
| Fourth class | 25 members. |  |
|  |  | 99 |
| Total |  | 352 |

Students from the Empire of Japan are received for instruction under a resolution of the Senate and House of Representatives of the United States approved July 27, 1868.

# RESIGNATIONS AND DISMISSALS.

*November* 1, 1878, *to November* 1, 1879.

## RESIGNATIONS.

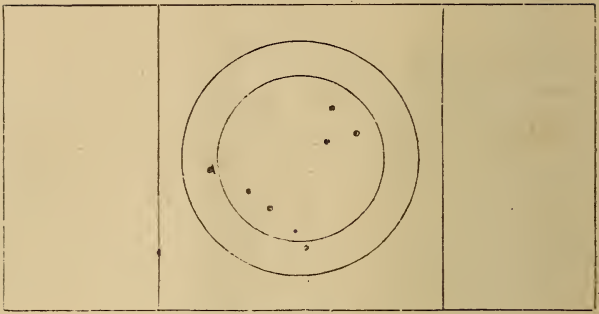
| | |
|---|---|
| Cadet-Engineer H. G. Dungan | Feb. 7, 1879 |
| Cadet-Midshipman J. F. Will | Mar. 19, 1879 |
| Cadet-Midshipman W. F. Babcock | Mar. 20, 1879 |
| Cadet-Midshipman R. W. Forrest | Mar. 20, 1879 |
| Cadet-Midshipman T. B. Franklin | Mar. 21, 1879 |
| Cadet-Midshipman P. Kennett | April 24, 1879 |
| Cadet-Midshipman J. Taylor | May 14, 1879 |
| Cadet-Midshipman A. S. Cooke | May 14, 1879 |
| Cadet-Engineer H. P. Prevear | Oct. 24, 1879 |

## DROPPED.

| | |
|---|---|
| Cadet-Midshipman R. R. Gurley | July 24, 1879 |
| Cadet-Midshipman J. B. Bailey | Aug. 20, 1879 |
| Cadet-Midshipman P. B. Cooke | Aug. 20, 1879 |
| Cadet-Midshipman L. Levisee | Aug. 20, 1879 |
| Cadet-Midshipman E. B. Webster | Aug. 20, 1879 |
| Cadet-Midshipman E. W. Foster | Aug. 20, 1879 |
| Cadet-Midshipman J. P. Porter | Aug. 20, 1879 |
| Cadet-Midshipman C. T. Phythian | Aug. 20, 1879 |
| Cadet-Midshipman J. L. Wickes | Aug. 20, 1879 |
| Cadet-Engineer F. M. Lillebridge | Aug. 20, 1879 |
| Cadet-Engineer C. A. Miller | Aug. 20, 1879 |
| Cadet-Engineer H. R. McCreary | Aug. 20, 1879 |
| Cadet-Engineer A. Nichols | Aug. 20, 1879 |

# ANNUAL RIFLE-MATCH

BETWEEN MEMBERS OF THE CLASS OF 1879.



Target showing score of H. L. Sturdivant.

TERMS OF THE MATCH.

Target, that adopted by the National Rifle Association of 1875.
Distance, 400 yards.
Rifle, Remington Navy.
Position, that of a skirmisher lying down.
Number of shots, 7.
Possible score, 35.

| Name. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | Total. |
|---|---|---|---|---|---|---|---|---|
| H. L. Sturdivant | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 33 |
| L. M. Garrett | 5 | 3 | 5 | 5 | 5 | 5 | 3 | 31 |
| E. E. Hayden | 5 | 5 | 4 | 5 | 4 | 4 | 4 | 31 |
| J. L. Purcell | 5 | 5 | 3 | 5 | 4 | 4 | 3 | 29 |
| H. S. Chase | 5 | 3 | 5 | 5 | 3 | 3 | 4 | 28 |
| Total | .... | .... | .... | .... | .... | .... | .... | 152 |

Average score of class ........ 17.3

# SUMMER CRUISE, 1879.

## OFFICERS AND CADET-MIDSHIPMEN

ATTACHED TO THE

## UNITED STATES PRACTICE-SHIP CONSTELLATION

Commander F. V. McNAIR, *Commanding.*
Lieutenant M. R. S. MACKENZIE, *Executive Officer.*
Lieutenant S. W. VERY, *Navigator.*
Lieutenant D. DELEHANTY, *Watch-Officer.*
Lieutenant W. J. BARNETTE, *Instructor in Navigation.*
Lieutenant R. T. JASPER, *Watch-Officer.*
Lieutenant S. C. PAINE, *Watch-Officer.*
Master S. A. STAUNTON, *Watch-Officer.*
Master C. W. BARTLETT, *Watch-Officer.*
Paymaster, A. S. KENNY.
Chaplain, R. HUDSON.
Surgeon, M. L. RUTH.
Passed Assistant Surgeon R. O. WHITING.
Paymaster's Clerk, JAMES McGREGOR.
Clerk to Commandant of Cadets, C. M. McLEOD.

### CADET-MIDSHIPMEN.

*First class* (62).

Ackerman, A. A.
Alger, P. R.
Ashmore, H. B.
Beale, Joseph
Belmont, O. H. P.
Bernadou, J. B.
Bowdon, F. W.
Brainard, F. R.
Brinley, Edward
Brown, J. S.
Buchanan, W. W.
Bullitt, H. H.
Cabaniss, C.
Clark, L. J.
Cramer, A.
Dewey, T. G.
Dickson, J. M.
Dillman, G. L.
Drake, J. C.
Dresel, H. G.
Duncan, L.
Emerson, W. H.
Eyre, M. K.
Fillebrowne, H. L.
Finley, H. M.
French, G. R.
Gorgas, M. C.
Gray, J.
Haeseler, F. J.
Haskell, P. D.
Hill, C. H.
Hourigan, P. W.
Howze, A. R.
Huntoon, F. A.
Lieper, E. F.
Luby, J. F.
Maxwell, W. J.
Mayer, A. N.
Morgan, S.
Muir, W. C. P.
Nash, E. W.
Niblack, A. P.
Norton, L. S.
Parke, T. A.
Phelps, H.
Poundstone, H. C.
Richardson, W. G.
Rodman, H.
Rohrbacker, J. H.
Safford, W. E.
Scott, R. H.
Sims, W. S.
Simpson, E.
Swift, F.
Truxtun, W.
Van Duzer, L. S.
Wall, F. R.
Watters, J. S.
West, G. E.
Wilkinson, E.
Wolfersberger, W. H.
Worthington, T.

*Second class* (6).

Bonfils, T. L.
Enouye, Y.
Gresham, W. A.
Hasson, A. R.
McKee, L. T.
Perry, G. E.

*Third class* (52).

Anderson, E. A.
Arnold, J. T.
Ashby, S.
Barnard, J. H.
Bell, E. N.
Bennett, L. S.
Blake, R. B.
Blandin, J. J.
Conway, J. J.
Dent, S. H.
Doyle, J. G.
Dudley, C. J.
Duncan, W. B.
Eames, H. H.
Field, R. M.
Fletcher, W. B.
Fowler, H.
Grambs, W. J.
Gwyn, L. S.
Hayden, T. W.
Howard, W. L.
Horst, H. A.
Hubbard, N. M.
Hoke, W. P.
Jayne, J. L.
Johnston, M.
Kenkel, H. H.
Kent, G. E.
Key, A. L.
Lamkin, J. A.
Lodeman, F. F. E.
Martin, C.
McGiffin, P. N.
McNutt, F. A.
McWhorter, J. G.
Miner, J. R.
Morris, W. E.
Nixon, L.
Norton, O. D.
Paine, W. T.
Patterson, S. A. W.
Poyer, J. M.
Prince, T. C.
Savage, L. R.
Semple, L.
Slack, W. Y.
Smythe, J. W.
Stahle, F. H.
Sutphen, E. W.
Von Schrader, G. M.
Whittelsey, W. B.
Wood, S. S.

The Constellation sailed from Annapolis June 18, and arrived in Hampton Roads June 20; from thence on her practice-cruise, touching at Halifax, Mount Desert, Bar Harbor, Portland, Me., Isle of Shoals, Rye Beach, Boston, New Bedford, Buzzard's Bay, Bristol, and Newport, R. I., and sailed from thence August 25 for Annapolis, and anchored off the Naval Academy August 29, 1879.

## UNITED STATES PRACTICE-STEAMER MAYFLOWER.

Lieutenant-Commander W. M. Folger, *Commanding.*
Lieutenant L. C. Logan, *Executive Officer.*
Passed Assistant Engineer C. H. Manning.
Assistant Engineer A. V. Zane.
Cadet-Engineers B. C. Bryan and C. A. Carr, *Assistant Instructors.*
Assistant Surgeon E. H. Marsteller.

CADET-ENGINEERS, FIRST CLASS.

Alderdice, W. H.
Durand, W. F.
Hall, H.
Hasson, W. F. C.
Hogan, T. J.
King, C. A.
Kinkaid, T. W.
Manning, C. E.
Mathews, C. H.
Miner, L. D.
Sample, W. S.
Smith, A. E.
Stahl, A. W.
Weaver, W. D.
Wood, J. L.
Woods, A. T.
Worthington, J. L.
Young, A. O.
Smith, W. S.

## UNITED STATES PRACTICE-STEAMER STANDISH.

Lieutenant-Commander F. W. Dickins, *Commanding.*
Lieutenant J. W. Miller, *Executive Officer.*
Passed Assistant Engineer R. W. Milligan.
Cadet-Engineers W. M. McFarland and J. F. Baker, *Assistant Instructors.*
Assistant Paymaster M. C. McDonald.
Assistant Surgeon James E. Gardner.

CADET-ENGINEERS, THIRD CLASS.

Addicks, W. R.
Chambers, W. H.
Clarke, A. H.
Coley, F. E.
Conant, F. H.
Creighton, W. H. P.
Ferguson, G. R.
Fitts, J. R.
Gatewood, R. W.
Gladstone, D. D.
Gsantner, O. C.
Hawthorne, H. L.
Higgins, R. B.
Howland, C. H.
Leonard, J. C.
Leopold, H. G.
Miller, P.
Pendleton, J. H.
Prevear, H. P.
Quinby, J. H.
Rommell, C. E.
Shock, T. A. W.
Simpson, H. L.
Taylor, E. K.
Theiss, E.
Willis, C. C.
Winchell, W. P.
Yonchi, S.

The practice-steamers Mayflower and Standish steamed from the Naval Academy June 13; touched at Norfolk, Va.; New Castle and Wilmington, Del.; Chester and Philadelphia, Pa.; Perth Amboy, N. J.; Cold Spring and New York City, N. Y.; New London, Conn.; New Bedford, Mass.; Bristol and Newport, R. I.; returning touched at Navy-Yard, Washington, and anchored at the Naval Academy August 30, 1879.

*Table of coefficients to be applied to the final averages in each branch in preparing the merit-rolls.*

## CADET-MIDSHIPMEN.

| Department. | Subject. | Coefficients. | | | | Graduating maxima for required studies. |
|---|---|---|---|---|---|---|
| | | First year—fourth class. | Second year—third class. | Third year—second class. | Fourth year—first class. | |
| Seamanship | Seamanship | 2 | 3 | 10 | 16 | 148 |
| | Ship-building | ...... | ...... | ...... | 4 | |
| | Naval Tactics | ...... | ...... | 2 | ...... | |
| Ordnance and Gunnery | Ordnance Instructions and Infantry Tactics | ...... | ...... | 5 | ...... | 76 |
| | Ordnance and Armor | ...... | ...... | ...... | 14 | |
| Mathematics | Algebra and Geometry | 8 | ...... | ...... | ...... | 104 |
| | Trigonometry | ...... | 8 | ...... | ...... | |
| | Analytical Geometry | ...... | 7 | ...... | ...... | |
| | Descriptive Geometry | ...... | 3 | ...... | ...... | |
| Steam-Engineering | Marine Engines | ...... | | ...... | 13 | 52 |
| Astronomy, Navigation, and Surveying | General Astronomy | ...... | ...... | 6 | ...... | 92 |
| | Theoretical Navigation | ...... | ...... | ...... | 9 | |
| | Practical Navigation | ...... | ...... | ...... | 8 | |
| | Surveying, Compass Deviations | ...... | ...... | ...... | | |
| Physics and Chemistry | Physics and Chemistry | ...... | 4 | 5 | ...... | 80 |
| | Light and Heat | ...... | ...... | 5 | ...... | |
| | Electricity | ...... | ...... | ...... | 6 | |
| Mechanics and Applied Mathematics | Mechanics and Applied Mathematics | ...... | ...... | 14 | ...... | 56 |
| | Naval Architecture | ...... | ...... | ...... | *12 | |
| English Studies, History, and Law | English and History | 5 | ...... | ...... | ...... | 76 |
| | History and Rhetoric | ...... | 6 | ...... | ...... | |
| | Composition | ...... | ...... | 5 | ...... | |
| | Public Law | ...... | ...... | ...... | 3 | |
| Modern Languages | French | 2 | 5 | 5 | 3 | 60 |
| Drawing | Drawing | 2 | 2 | ...... | ...... | 16 |
| Maximum for each year, exclusive of electives | | 76 | 152 | 228 | 304 | 760 |
| Deduction for each demerit | | .004 | .007 | .013 | .03 | ...... |

* Elective.

*Table of coefficients to be applied to the final averages in each branch in preparing the merit-rolls.*

CADET-ENGINEERS.

| Department. | Subject. | Coefficients. | | | | Graduating maxima for required studies. |
|---|---|---|---|---|---|---|
| | | First year—fourth class. | Second year—third class. | Third year—second class. | Fourth year—first class. | |
| Seamanship | Ship-building | ...... | ...... | ...... | 4 | 16 |
| Mathematics | Algebra and Geometry | 9 | ...... | ...... | ...... | 108 |
| | Trigonometry | ...... | 6 | .... | ...... | |
| | Analytical Geometry | ...... | 7 | ...... | ...... | |
| | Descriptive Geometry | ...... | 5 | ...... | ...... | |
| Steam-Engineering | Mechanical Drawing | 3 | 5 | 5 | 14 | 252 |
| | Fabrication of Machinery | .... | ...... | 6 | | |
| | Designing of Machinery | ...... | ..... | 8 | 22 | |
| | Marine Engines | ...... | ...... | .... | | |
| Astronomy, Navigation, and Surveying | General Astronomy | ...... | ..... | 4 | ..... | 16 |
| Physics and Chemistry | Physics and Chemistry | ...... | 4 | 5 | ..... | 108 |
| | Light and Heat | .... | ...... | 5 | ...... | |
| | Electricity | .... | ...... | ...... | 6 | |
| | Physical Measurements | .... | ...... | ...... | 7 | |
| Mechanics and Applied Mathematics | Mechanics and Applied Mathematics | ...... | ...... | 14 | ...... | 124 |
| | Mechanics | .... | ...... | ...... | 11 | |
| | Naval Architecture and the Method of Least Squares | ...... | ...... | ...... | 6 | |
| | Elective course in Naval Architecture | ...... | ...... | ...... | 12 | |
| English Studies, History, and Law | English and History | 5 | .... | ...... | ...... | 76 |
| | History and Rhetoric | .... | 6 | ...... | ..... | |
| | Composition | ...... | ...... | 5 | ..... | |
| | Public Law | ...... | ..... | ...... | 3 | |
| Modern Languages | French | 2 | 5 | 5 | 3 | 60 |
| Maximum for each year, exclusive of electives | | 76 | 152 | 228 | 304 | 760 |
| Deduction for each demerit | | .004 | .007 | .013 | .03 | ...... |

# MERIT-ROLLS FOR 1878-79.

Merit-rolls, made out yearly for each class, show the proficiency of the Cadets in each branch of study. The numbers given in the preceding table, showing the relative weight of the different branches, are used as coefficients; the final mark in each branch (on a scale of 4) being multiplied by the number assigned to that branch. The sum of the products, after making deductions for conduct, is the final mark of the Cadet for the year.

In the case of Cadets who take an elective course in any branch, the final mark in that branch is determined by adding to the final mark received in the required course one-fifth of the amount by which the final mark in the elective course exceeds 2.50.

In the graduating merit-roll, the final mark for the course is determined by the sum of the four yearly marks.

"Cadets who attain 85 per cent. of the multiple in any year shall be distinguished by a star affixed to their names on the merit-rolls."—(Regulations U. S. Naval Academy, § 150.)

Cadets whose names are marked thus (†) were found deficient, but were allowed to continue in their classes on condition of passing at a re-examination.

Those marked thus (‡) were found deficient, and turned back, to recommence the studies of their respective classes.

Those marked thus (§) were found deficient, and recommended to be dropped.

*a* denotes absence from examination.

## MIDSHIPMEN.

*Class of* 1877 (42 *members*). *Final examination, June*, 1879.

| Order of merit. | Name. | Seamanship. | Naval tactics. | Gunnery. | French. | Steam-engineering. | Navigation. | Aptitude. | Aggregate. | Aggregate for four years. | Final aggregate. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maxima | **48** | **12** | **48** | **24** | **48** | **48** | **12** | **240** | **751.91** | **991.91** |
| *1 | **William F. Fullam** | 44.40 | 11.79 | 39.36 | 18.60 | 39.84 | 44.40 | 12.00 | 210.39 | 660.18 | 870.57 |
| 2 | Horace M. Witzel | 39.24 | 9.75 | 33.36 | 18.00 | 35.52 | 40.80 | 9.90 | 186.57 | 655.53 | 842.10 |
| 3 | Omenzo G. Dodge | 42.36 | 9.93 | 30.72 | 19.08 | 38.40 | 44.40 | 9.90 | 194.79 | 625.54 | 820.33 |
| 4 | William G. David | 36.72 | 9.90 | 39.36 | 19.68 | 34.44 | 43.80 | 9.00 | 192.90 | 623.66 | 816.56 |
| 5 | John M. Orchard | 38.64 | 9.09 | 33.84 | 19.80 | 36.36 | 42.00 | 9.00 | 188.73 | 610.01 | 798.74 |
| 6 | Hiero Taylor | 37.56 | 8.73 | 37.20 | 18.42 | 32.40 | 43.20 | 10.50 | 188.01 | 602.35 | 790.36 |
| 7 | Russel C. Paris | 38.52 | 11.55 | 35.88 | 21.00 | 31.44 | 34.80 | 9.00 | 182.19 | 603.14 | 785.33 |
| 8 | Alfred Jeffries | 38.88 | 8.25 | †26.28 | 17.58 | †28.68 | 38.40 | 11.10 | 169.17 | 615.68 | 784.85 |
| 9 | William V. Bronaugh | 36.96 | 9.93 | †28.68 | 17.82 | 33.84 | 39.00 | 9.00 | 175.23 | 606.17 | 781.40 |
| 10 | John N. Jordan | 38.28 | 8.97 | 31.92 | 17.28 | 33.60 | 43.80 | 8.40 | 182.25 | 598.65 | 780.90 |
| 11 | Augustus F. Fechteler | 38.40 | 8.58 | 37.08 | 18.90 | 36.72 | 38.40 | 10.50 | 188.58 | 590.95 | 779.53 |
| 12 | Thomas M. Brumby | 37.56 | 9.54 | 35.08 | 16.86 | 37.20 | 40.20 | 8.40 | 184.84 | 579.76 | 764.60 |
| 13 | Edward E. Wright | 43.20 | 8.40 | 32.88 | 17.28 | 41.64 | 39.00 | 9.00 | 191.40 | 566.48 | 757.88 |
| 14 | Jonathan K. Brice | 37.56 | 9.69 | 33.96 | 17.58 | 34.56 | 37.80 | 8.10 | 179.25 | 578.21 | 757.46 |
| 15 | Albert Gleaves | 42.96 | 8.76 | 33.84 | 17.10 | 37.56 | 37.20 | 11.40 | 188.82 | 559.92 | 748.74 |
| 16 | Selim E. Woodworth | 40.68 | 7.74 | 36.72 | 19.62 | 39.48 | 31.80 | 9.90 | 185.94 | 562.50 | 748.44 |
| 17 | Frank M. Bostwick | 36.36 | †7.20 | 33.36 | 18.60 | 35.88 | 40.20 | 7.50 | 179.10 | 565.95 | 745.05 |
| 18 | James P. Parker | 35.88 | 11.01 | 35.64 | 18.90 | 34.56 | 39.60 | 12.00 | 187.59 | 551.22 | 738.81 |
| 19 | Harry C. Wakenshaw | 34.08 | 10.59 | 36.24 | 16.02 | 39.84 | 35.40 | 9.00 | 181.17 | 552.38 | 733.55 |
| 20 | Walter M. Constant | 35.76 | 9.39 | 31.92 | †13.50 | 36.72 | 34.80 | 12.00 | 174.09 | 559.24 | 733.33 |
| 21 | Ben. W. Hodges | 32.76 | 8.10 | 31.56 | 19.02 | 34.80 | 41.40 | 9.60 | 177.24 | 549.11 | 726.35 |
| 22 | James H. Oliver | 34.56 | 7.95 | †27.00 | 19.20 | 34.32 | 40.20 | 8.10 | 171.33 | 554.06 | 725.39 |
| 23 | Herbert O. Dunn | 37.56 | 10.14 | 36.12 | 15.60 | 38.88 | 38.40 | 10.50 | 187.20 | 534.72 | 721.92 |
| 24 | Arthur W. Dodd | 33.96 | 7.71 | 30.24 | 17.28 | 32.76 | 37.20 | 8.40 | 167.55 | 552.99 | 720.54 |
| 25 | George W. Denfeld | 36.12 | 9.09 | 32.88 | 16.62 | 36.96 | 40.80 | 9.90 | 182.37 | 536.69 | 719.06 |
| 26 | Albert W. Grant | 36.00 | 8.40 | 32.64 | 15.66 | 38.40 | 33.00 | 10.50 | 174.60 | 543.71 | 718.31 |
| 27 | Frank W. Toppan | 38.28 | 9.30 | 31.32 | 17.88 | 39.12 | 39.00 | 9.60 | 184.50 | 530.32 | 714.82 |
| 28 | Frank R. Heath | 39.72 | 8.40 | 30.00 | 18.60 | 35.40 | 39.00 | 12.00 | 183.12 | 523.62 | 706.74 |
| 29 | Nicholas J. L. T. Halpine | 39.48 | †7.41 | †26.40 | 19.08 | 35.40 | 35.40 | 9.00 | 172.17 | 534.54 | 706.71 |
| 30 | Harry M. Dombaugh | 37.08 | †6.09 | 36.48 | 15.06 | 38.64 | 36.00 | 8.40 | 177.75 | 524.66 | 702.41 |
| 31 | Frank B. Case | 34.32 | 9.39 | †26.52 | †11.82 | 36.24 | 37.20 | 11.40 | 166.89 | 533.41 | 700.30 |
| 32 | Philip V. Lansdale | 31.20 | 8.97 | 33.36 | 17.40 | 35.88 | 41.40 | 9.00 | 177.21 | 519.82 | 697.03 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | William L. Burdick | 30.72 | 7.95 | 36.48 | 15.90 | 39.48 | 42.60 | 7.50 | 180.63 | 511.41 | 692.04 |
| 35 | William R. Rush | 35.76 | 9.30 | †28.92 | 16.38 | 36.60 | 37.20 | 12.00 | 176.16 | 514.74 | 690.90 |
| 36 | William S. Benson | 35.40 | 9.90 | 32.88 | 15.60 | 33.00 | 34.80 | 10.50 | 172.08 | 516.90 | 688.98 |
| 37 | Alfred L. Hall | 37.56 | †7.14 | 31.20 | †10.68 | 34.68 | 33.60 | 11.40 | 166.26 | 512.46 | 678.72 |
| 38 | Percival J. Werlich | 36.00 | †6.57 | 30.36 | 18.06 | 37.08 | †27.00 | 7.50 | 162.57 | 515.74 | 678.31 |
| 39 | Henry A. Johnson | 33.96 | †6.54 | †28.56 | 18.06 | 32.04 | 37.80 | 9.00 | 165.96 | 506.94 | 672.90 |
| 40 | Simon Cook | 32.28 | 7.89 | †25.68 | 15.42 | †28.92 | 33.60 | 9.90 | 153.69 | 499.32 | 653.01 |
| | Valentine S. Nelson | ........ | ........ | ........ | ........ | ........ | ........ | ........ | *a* | 559.08 | ........ |
| | Albert G. Winterhalter | ........ | ........ | ........ | ........ | ........ | ........ | ........ | *a* | 621.83 | ........ |

† Re-examined in September.

## CADET-MIDSHIPMEN.

*Merit-roll of first class (41 members), annual examination, June, 1879, and general merit-roll for four years.*

| Order of general merit. | Name. | Seamanship. | Naval construction. | Naval architecture (e lective). | Ordnance. | Marine engines. | Navigation. | Light and heat. | Law. | Spanish. | Conduct. | Aggregate for fourth year. | Aggregate for third year. | Aggregate for second year. | Aggregate for first year. | General aggregate for four years. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maxima | **60.00** | **16.00** | **3.60** | **56.00** | **52.00** | **64.00** | **32.00** | **12.00** | **12.00** | ........ | **304.00** | **228.00** | **152.00** | **76.00** | **760.00** |
| *1 | **Randolph H. Miner** | 50. 85 | 13. 68 | 2. 64 | 49. 70 | 46. 80 | 55. 52 | 27. 44 | 11. 19 | 10. 50 | 0. 87 | 267. 45 | 204. 71 | 138. 03 | 63. 43 | 673. 62 |
| *2 | **John Hood** | 49. 65 | 13. 60 | 2. 64 | 49. 28 | 47. 71 | 56. 32 | 29. 36 | 11. 16 | 9. 21 | 2. 55 | 266. 38 | 199. 41 | 137. 30 | 64. 04 | 667. 13 |
| *3 | **Abner B. Clements** | 45. 60 | 12. 76 | 3. 12 | 45. 08 | 45. 24 | 56. 00 | 27. 52 | 10. 56 | 9. 36 | 1. 50 | 253. 74 | 199. 94 | 139. 40 | 62. 41 | 655. 49 |
| *4 | **Edward E. Hayden** | 46. 65 | 13. 16 | 2. 40 | 46. 48 | 45. 11 | 55. 36 | 25. 52 | 10. 41 | 10. 74 | 2. 13 | 253. 70 | 201. 00 | 137. 48 | 61. 91 | 654. 09 |
| 5 | Henry T. Chase | 48. 60 | 12. 08 | 2. 28 | 48. 58 | 45. 76 | 53. 12 | 26. 24 | 10. 50 | 10. 50 | 2. 97 | 254. 69 | 188. 44 | 127. 92 | 57. 11 | 628. 16 |
| 6 | John M. Moore | 49. 35 | 13. 92 | 2. 16 | 47. 46 | 42. 12 | 51. 52 | 25. 44 | 11. 10 | 10. 05 | 2. 55 | 250. 57 | 185. 70 | 122. 89 | 57. 32 | 616. 48 |
| 7 | LeRoy M. Garrett | 51. 60 | 12. 52 | ....... | 48. 30 | 42. 64 | 53. 44 | 24. 40 | 10. 38 | 11. 04 | 1. 62 | 252. 70 | 185. 44 | 120. 16 | 56. 16 | 614. 46 |
| 8 | Charles C. Marsh | 48. 30 | 12. 92 | ....... | 46. 34 | 40. 82 | 50. 24 | 24. 16 | 10. 47 | 10. 38 | 3. 09 | 240. 54 | 183. 61 | 118. 80 | 58. 47 | 601. 42 |
| 9 | Robert T. Sloan | 48. 90 | 12. 88 | ....... | 51. 10 | 40. 82 | 49. 12 | 22. 64 | 10. 32 | 8. 55 | 2. 19 | 242. 14 | 175. 33 | 117. 54 | 57. 37 | 592. 38 |
| 10 | Charles W. Jungen | 48. 90 | 12. 44 | ....... | 45. 64 | 41. 60 | 48. 00 | 22. 80 | 10. 20 | 9. 48 | 1. 86 | 237. 20 | 177. 26 | 115. 68 | 59. 09 | 589. 23 |
| 11 | John B. Blish | 46. 95 | 11. 16 | ....... | 44. 52 | 42. 38 | 49. 44 | 22. 00 | 10. 44 | 9. 18 | 2. 28 | 233. 79 | 185. 33 | 111. 84 | 55. 46 | 586. 42 |
| 12 | Charles H. Harlow | 50. 70 | 14. 48 | ....... | 48. 16 | 43. 16 | 49. 92 | 21. 12 | 10. 08 | 9. 99 | 1. 29 | 246. 32 | 172. 66 | 110. 36 | 55. 06 | 584. 40 |
| 13 | Harvey Wike | 43. 65 | 11. 28 | 2. 04 | 41. 16 | 39. 26 | 52. 00 | 25. 68 | 9. 21 | 8. 04 | 3. 75 | 228. 57 | 177. 73 | 118. 85 | 56. 85 | 582. 00 |
| 14 | William A. Gill | 46. 20 | 12. 64 | ....... | 45. 92 | 44. 85 | 50. 40 | 25. 68 | 9. 48 | 9. 09 | 3. 09 | 241. 17 | 167. 16 | 112. 65 | 52. 65 | 573. 63 |
| 15 | Rennie P. Schwerin | 48. 00 | 13. 00 | ....... | 47. 18 | 40. 69 | 49. 12 | 23. 36 | 9. 84 | 8. 91 | 1. 50 | 238. 60 | 170. 47 | 105. 90 | 56. 81 | 571. 78 |
| 16 | Charles S. Ripley | 42. 00 | 12. 00 | ....... | 40. 18 | 41. 86 | 43. 04 | 21. 12 | 9. 54 | 8. 28 | 1. 29 | 216. 73 | 168. 44 | 112. 59 | 58. 92 | 556. 68 |
| 17 | John Gibson | 42. 45 | 11. 40 | ....... | 44. 38 | 40. 30 | 48. 80 | 23. 04 | 9. 72 | 8. 19 | 0. 90 | 227. 38 | 161. 31 | 110. 04 | 57. 09 | 555. 82 |
| 18 | James B. Cahoon | 45. 45 | 11. 40 | ....... | 44. 80 | 39. 13 | 46. 72 | 22. 32 | 9. 78 | 8. 85 | 1. 02 | 227. 43 | 166. 02 | 111. 40 | 49. 54 | 554. 39 |
| 19 | Walter J. Sears | 45. 00 | 11. 76 | ....... | 43. 82 | 41. 34 | 50. 08 | 24. 16 | 9. 54 | 9. 84 | 1. 83 | 233. 71 | 162. 69 | 105. 53 | 50. 47 | 552. 40 |
| 20 | Leigh O. Garrett | 52. 05 | 11. 96 | ....... | 45. 50 | 38. 61 | 46. 24 | 21. 44 | 9. 36 | 8. 40 | 1. 92 | 231. 64 | 167. 50 | 103. 91 | 49. 08 | 552. 13 |
| 21 | Daniel P. Menefee | 44. 10 | 11. 72 | ....... | 42. 56 | 38. 48 | 44. 48 | 22. 08 | 9. 33 | 9. 84 | 2. 22 | 220. 37 | 167. 73 | 103. 59 | 56. 42 | 548. 11 |
| 22 | Thomas Snowden | 42. 30 | 11. 44 | ....... | 43. 68 | 37. 83 | 46. 08 | 21. 04 | 10. 71 | 9. 12 | 0. 66 | 221. 54 | 162. 22 | 105. 99 | 52. 22 | 541. 97 |
| 23 | John A. Dougherty | 44. 70 | 11. 36 | ....... | 43. 40 | 38. 09 | 45. 76 | 20. 32 | 9. 30 | 8. 22 | 1. 11 | 220. 04 | 155. 13 | 105. 75 | 55. 90 | 536. 82 |
| 24 | John A. Bell | 42. 75 | 10. 84 | ....... | 41. 02 | 40. 56 | 43. 52 | 21. 36 | 9. 45 | 8. 10 | 2. 55 | 215. 05 | 152. 57 | 105. 08 | 58. 36 | 531. 06 |
| 25 | Edwin H. Tillman | 40. 35 | 11. 52 | ....... | 39. 48 | 39. 91 | 43. 84 | 23. 20 | 9. 30 | 7. 92 | 2. 55 | 212. 97 | 159. 33 | 101. 37 | 54. 66 | 528. 33 |
| 26 | Francis W. Kellogg | 42. 75 | 10. 68 | ....... | 40. 32 | 39. 39 | 48. 00 | 22. 00 | 9. 24 | 8. 37 | 2. 13 | 218. 62 | 157. 68 | 100. 34 | 51. 36 | 528. 00 |
| 27 | John H. Gibbons | 41. 40 | 11. 76 | ....... | 42. 70 | 37. 44 | 44. 00 | 20. 56 | 9. 84 | 8. 97 | 3. 12 | 213. 55 | 159. 22 | 101. 58 | 52. 60 | 526. 95 |
| 28 | Herbert J. Robinson | 43. 20 | 11. 44 | | 39. 06 | 35. 10 | 41. 28 | 21. 36 | 9. 18 | 9. 21 | 3. 96 | 205. 87 | 155. 82 | 106. 18 | 56. 79 | 524. 66 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | Andrew C. Cunningham | 43. 65 | 10. 64 | ........ | 40. 60 | 34. 97 | 38. 88 | 17. 76 | 8. 61 | 7. 74 | 2. 10 | 200. 75 | 161. 11 | 103. 48 | 56. 02 | 521. 36 |
| 30 | Louis H. Barnard | 43. 50 | 10. 72 | ........ | 39. 76 | 35. 10 | 42. 40 | 20. 08 | 9. 15 | 9. 00 | 2. 28 | 207. 43 | 151. 93 | 104. 41 | 56. 76 | 520. 53 |
| 31 | Guy W. Brown | 42. 75 | 10. 64 | ........ | 39. 90 | 38. 87 | 42. 88 | 21. 60 | 9. 39 | 7. 89 | 1. 29 | 212. 63 | 156. 63 | 96. 64 | 52. 43 | 518. 33 |
| 32 | William A. Thom | 39. 00 | 10. 84 | ........ | 40. 46 | 36. 14 | 44. 32 | 20. 40 | 9. 42 | 8. 73 | 0. 78 | 208. 53 | 157. 13 | 99. 50 | 50. 61 | 515. 77 |
| 33 | Robert F. Lopez | 40. 50 | 10. 60 | ........ | 38. 08 | 37. 05 | 42. 24 | 20. 56 | 8. 94 | 8. 19 | 2. 52 | 203. 64 | 158. 02 | 100. 67 | 52. 51 | 514. 84 |
| 34 | Percival L. Drayton | 43. 35 | 11. 92 | ........ | 38. 78 | 38. 09 | 43. 04 | 20. 64 | 9. 33 | 8. 76 | 3. 21 | 210. 70 | 158. 84 | 92. 35 | 52. 80 | 514. 69 |
| 35 | Maurice L. Read | 40. 65 | 11. 08 | ........ | 40. 04 | 38. 09 | 42. 72 | 20. 48 | 10. 35 | 8. 55 | 1. 83 | 210. 13 | 152. 01 | 97. 90 | 52. 09 | 512. 13 |
| 36 | John A. Mudd | 41. 55 | 11. 60 | ........ | 40. 46 | 35. 49 | 44. 16 | 20. 00 | 8. 88 | 7. 95 | 3. 75 | 206. 34 | 155. 08 | 97. 53 | 49. 62 | 508. 57 |
| 37 | William A. Graham | 42. 15 | 10. 60 | ........ | 38. 50 | 36. 14 | 41. 12 | 19. 28 | 8. 82 | 7. 89 | 1. 71 | 202. 79 | 145. 55 | 95. 51 | 53. 23 | 497. 08 |
| 38 | Reuben O. Bitler | 37. 50 | 10. 48 | ........ | 36. 12 | 36. 66 | 39. 20 | 18. 24 | 9. 00 | 8. 25 | 2. 31 | 193. 14 | 147. 89 | 93. 42 | 49. 82 | 484. 27 |
| † | John L. Purcell | 44. 55 | 12. 28 | ........ | 42. 70 | 34. 71 | 45. 44 | 19. 04 | 10. 08 | 8. 04 | 2. 07 | 214. 77 | 147. 46 | 97. 27 | 55. 01 | 514. 51 |
| † | George S. Welsh | 36. 30 | 11. 20 | ........ | 39. 76 | 38. 09 | 42. 40 | 21. 20 | 8. 67 | 7. 74 | 3. 18 | 202. 18 | 150. 58 | 93. 77 | 51. 10 | 497. 63 |
| † | Harry L. Sturdivant | 37. 35 | 10. 28 | ........ | 38. 50 | 35. 75 | 39. 84 | 22. 32 | 8. 70 | 7. 80 | 3. 69 | 196. 85 | 137. 61 | 100. 23 | 53. 98 | 488. 67 |

## CADET-MIDSHIPMEN.

*Merit-roll of second class (66 members), annual examination, June, 1879,*

| Order of annual merit. | Name. | Seamanship. | Naval tactics. | Ordnance instruction and infantry tactics. | Astronomy. | Electricity. | Mechanics and applied mathematics. | English composition. | French. | Conduct. | Aggregate. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maxima for this class and year | **48** | **8** | **20** | **24** | **24** | **56** | **20** | **28** | ........ | **228** |
| *1 | **Philip R. Alger** | 39.12 | 6.34 | 17.75 | 20.76 | 22.68 | 58.66 | 16.20 | 24.94 | 1.62 | 204.83 |
| *2 | **Herman G. Dresel** | 39.24 | 6.86 | 18.10 | 19.74 | 20.64 | 54.18 | 18.05 | 26.25 | 1.10 | 201.96 |
| *3 | **Homer C. Poundstone** | 41.88 | 7.42 | 17.50 | 21.00 | 19.56 | 46.48 | 17.65 | 24.78 | 0.84 | 195.43 |
| 4 | John B. Bernadou | 38.52 | 5.96 | 17.45 | 16.92 | 17.94 | 54.46 | 17.60 | 26.38 | 1.72 | 193.51 |
| 5 | Harry Phelps | 40.44 | 7.22 | 17.30 | 20.10 | 18.78 | 51.80 | 15.55 | 23.62 | 1.36 | 193.45 |
| 6 | Patrick W. Hourigan | 42.00 | 7.14 | 17.45 | 19.50 | 19.92 | 45.64 | 19.55 | 22.93 | 2.13 | 192.00 |
| 7 | Luman S. Norton | 37.44 | 6.98 | 16.75 | 20.16 | 20.94 | 52.64 | 15.70 | 21.30 | 1.66 | 190.25 |
| 8 | Albert A. Ackerman | 36.72 | 6.28 | 16.75 | 19.80 | 19.68 | 50.54 | 15.95 | 19.39 | 1.25 | 183.86 |
| 9 | Albert P. Niblack | 37.68 | 7.12 | 17.05 | 19.26 | 20.10 | 40.32 | 17.30 | 21.29 | 0.60 | 179.52 |
| 10 | William H. Wolfersberger | 36.00 | 6.78 | 16.05 | 18.18 | 18.60 | 45.50 | 17.80 | 21.15 | 0.73 | 179.33 |
| 11 | Porter D. Haskell | 37.20 | 6.78 | 15.90 | 18.72 | 18.12 | 41.72 | 17.10 | 23.56 | 0.30 | 178.80 |
| 12 | George E. West | 35.04 | 6.08 | 14.90 | 18.72 | 17.58 | 48.02 | 16.85 | 21.64 | 1.16 | 177.67 |
| 13 | Ernest Wilkinson | 35.88 | 5.62 | 15.10 | 18.60 | 16.56 | 42.28 | 18.25 | 26.06 | 1.60 | 176.75 |
| 14 | Stokely Morgan | 36.96 | 6.84 | 15.90 | 18.54 | 18.96 | 42.42 | 17.80 | 20.16 | 0.86 | 176.72 |
| 15 | Wilson W. Buchanan | 38.40 | 7.00 | 16.15 | 19.86 | 17.70 | 43.82 | 14.85 | 19.05 | 0.43 | 176.40 |
| 16 | Miles C. Gorgas | 37.08 | 7.10 | 15.90 | 16.50 | 16.86 | 43.40 | 15.40 | 23.59 | 2.03 | 173.80 |
| 17 | George L. Dillman | 36.96 | 5.88 | 13.90 | 16.80 | 16.68 | 44.94 | 16.30 | 21.68 | 1.55 | 171.59 |
| 18 | Joseph H. Rohrbacker | 36.36 | 6.70 | 15.20 | 17.04 | 17.46 | 40.32 | 18.05 | 21.15 | 0.82 | 171.46 |
| 19 | John S. Watters | 39.48 | 6.56 | 16.50 | 16.38 | 16.62 | 38.92 | 16.55 | 21.98 | 1.73 | 171.26 |
| 20 | Thomas A. Parke | 34.56 | 6.00 | 14.30 | 17.76 | 18.72 | 39.48 | 16.95 | 23.83 | 0.75 | 170.85 |
| 21 | William Truxtun | 37.08 | 6.50 | 17.05 | 17.64 | 16.86 | 39.90 | 17.60 | 19.07 | 1.29 | 170.41 |
| 22 | Arthur R. Howze | 34.68 | 6.36 | 13.60 | 15.96 | 17.16 | 42.98 | 15.10 | 24.79 | 0.43 | 170.20 |
| 23 | Francis J. Haeseler | 40.20 | 7.06 | 17.05 | 16.38 | 17.04 | 38.36 | 14.95 | 19.02 | 1.17 | 168.89 |
| 24 | Joseph Beale | 38.64 | 6.28 | 14.25 | 16.38 | 17.34 | 38.64 | 15.45 | 22.35 | 1.59 | 167.74 |
| 25 | Charles Cabaniss | 37.68 | 6.72 | 15.10 | 17.10 | 16.26 | 35.98 | 15.75 | 23.46 | 0.42 | 167.63 |
| 26 | William H. Emerson | 35.40 | 6.32 | 14.15 | 16.62 | 18.06 | 42.14 | 15.55 | 20.10 | 1.10 | 167.24 |
| 27 | Edward Simpson, jr | 38.28 | 6.92 | 16.55 | 16.20 | 17.46 | 36.12 | 16.55 | 19.24 | 1.39 | 165.93 |
| 28 | Louis S. Van Duzer | 36.84 | 5.72 | 15.50 | 16.44 | 15.90 | 38.08 | 17.65 | 20.87 | 1.18 | 165.82 |
| 29 | William C. P. Muir | 32.76 | 6.66 | 14.60 | 16.86 | 16.80 | 38.36 | 19.45 | 21.36 | 1.74 | 165.11 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | William E. Safford | 32.40 | 5.86 | 13.55 | 16.56 | 16.50 | 37.80 | 18.20 | 25.25 | 1.01 | 165.11 |
| 31 | Augustus N. Mayer | 36.96 | 6.78 | 15.60 | 16.86 | 17.28 | 35.84 | 17.05 | 20.21 | 1.49 | 165.09 |
| 32 | Louis Duncan | 36.84 | 5.44 | 14.65 | 16.20 | 17.88 | 39.34 | 16.90 | 19.17 | 1.51 | 164.91 |
| 33 | Manning K. Eyre | 36.72 | 6.16 | 13.00 | 16.14 | 17.64 | 38.36 | 16.10 | 23.41 | 2.72 | 164.81 |
| 34 | Frederick R. Brainard | 33.96 | 6.14 | 14.25 | 17.82 | 18.00 | 40.88 | 16.70 | 17.93 | 1.42 | 164.26 |
| 35 | Charles H. Hill | 39.84 | 6.90 | 13.65 | 15.78 | 17.94 | 39.20 | 15.45 | 18.44 | 3.17 | 164.03 |
| 36 | James C. Drake | 33.60 | 6.58 | 13.95 | 15.84 | 16.08 | 43.12 | 16.05 | 19.18 | 1.30 | 163.10 |
| 37 | Frank W. Bowden | 33.72 | 6.64 | 14.90 | 15.18 | 16.14 | 36.68 | 18.50 | 22.15 | 0.87 | 163.04 |
| 38 | Joseph M. Dickson | 32.88 | 5.94 | 14.35 | 16.98 | 16.74 | 39.34 | 15.50 | 21.69 | 0.40 | 163.02 |
| 39 | Francis R. Wall | 32.88 | 6.78 | 13.95 | 16.38 | 16.68 | 37.52 | 17.25 | 21.20 | 1.30 | 161.34 |
| 40 | Henry M. Finley | 33.84 | 5.74 | 13.45 | 16.02 | 17.10 | 37.38 | 17.95 | 21.82 | 2.27 | 161.03 |
| 41 | Edwards F. Lieper | 35.88 | 6.74 | 15.65 | 15.42 | 16.02 | 35.00 | 14.55 | 21.21 | 0.74 | 159.73 |
| 42 | William S. Sims | 35.52 | 5.92 | 15.00 | 16.26 | 16.50 | 37.66 | 15.30 | 18.70 | 1.92 | 158.94 |
| 43 | Richard H. Scott | 33.36 | 6.02 | 14.30 | 16.14 | 16.32 | 38.92 | 15.70 | 19.60 | 1.49 | 158.87 |
| 44 | Henry B. Ashmore | 33.48 | 6.16 | 13.85 | 15.48 | 16.98 | 37.10 | 17.00 | 20.78 | 2.29 | 158.54 |
| 45 | William J. Maxwell | 35.04 | 6.32 | 14.70 | 15.72 | 16.50 | 35.00 | 16.55 | 19.84 | 1.30 | 158.37 |
| 46 | Thomas Worthington | 34.92 | 5.74 | 14.45 | 15.00 | 15.42 | 35.00 | 18.05 | 21,30 | 1.77 | 158.11 |
| 47 | Walter G. Richardson | 34.56 | 6.08 | 13.75 | 15.54 | 17.10 | 35.14 | 15.55 | 21.13 | 1.20 | 157.65 |
| 48 | Horatio L. Fillebrown | 32.76 | 5.58 | 14.25 | 15.36 | 16.68 | 38.22 | 16.95 | 18.96 | 1.23 | 157.53 |
| 49 | Oliver H. P. Belmont | 33.48 | 5.02 | 13.95 | 15.18 | 16.38 | 36.26 | 15.15 | 23.81 | 2.92 | 156.31 |
| 50 | Franklin Swift | 33.48 | 5.98 | 13.75 | 15.18 | 17.64 | 36.54 | 16.50 | 18.09 | 1.27 | 155.89 |
| 51 | Theodore G. Dewey | 30.96 | 5.58 | 15.40 | 15.00 | 17.22 | 35.28 | 17.75 | 19.09 | 1.82 | 154.46 |
| 52 | Ambrose Cramer | 31.44 | 5.72 | 14.15 | 15.54 | 17.46 | 36.82 | 15.30 | 18.78 | 0.75 | 154.46 |
| 53 | John F. Luby | 36.48 | 5.50 | 15.10 | 14.46 | 16.08 | 35.70 | 14.30 | 18.52 | 1.77 | 154.37 |
| 54 | Fitz-Aubert Huntoon | 34.08 | 5.72 | 13.80 | 15.06 | 17.64 | 35.98 | 15.10 | 18.41 | 1.70 | 154.09 |
| 55 | George R. French | 32.16 | 6.16 | 12.55 | 15.12 | 15.78 | 37.80 | 16.40 | 19.71 | 1.94 | 153.74 |
| 56 | Lewis J. Clark | 31.44 | 5.98 | 13.90 | 15.84 | 16.44 | 38.92 | 14.40 | 18.50 | 2.04 | 153.38 |
| 57 | James Gray | 34.20 | 5.54 | 13.80 | 15.48 | 16.38 | 35.98 | 15.40 | 18.25 | 1.90 | 153.13 |
| 58 | Edwin W. Nash | 33.24 | 6.58 | 13.50 | 15.18 | 16.86 | 35.42 | 15.70 | 18.89 | 2.86 | 152.51 |
| 59 | James S. Brown | 31.80 | 5.80 | 13.25 | 14.10 | 16.92 | 36.12 | 15.45 | 18.02 | 1.59 | 149.87 |
| § | Leonidas Levisee | 37.20 | 6.00 | 15.25 | 12.78 | 16.26 | 25.76 | 17.40 | 21.15 | 1.17 | 150.63 |
| † | Edward Brinley | 29.64 | 6.00 | 13.15 | 15.06 | 15.60 | 36.26 | 14.95 | 19.03 | 1.20 | 148.49 |
| † | Hugh Rodman | 31.92 | 5.96 | 13.55 | 13.74 | 16.44 | 34.44 | 15.05 | 18.13 | 1.77 | 147.46 |
| † | Howard H. Bullitt | 31.92 | 4.96 | 12.50 | 14.40 | 15.72 | 35.14 | 16.20 | 17.79 | 1.22 | 147.41 |
| § | Paul B. Cooke | 32.76 | 5.46 | 14.20 | 13.02 | 15.00 | 31.64 | 14.45 | 19.18 | 2.66 | 143.05 |
| § | John B. Bailey | 32.16 | 5.84 | 12.65 | 12.36 | 14.28 | 29.68 | 16.60 | 18.95 | 1.79 | 140.73 |
| § | Edwin B. Webster | 31.32 | 5.38 | 13.60 | 11.58 | 15.30 | 28.42 | 15.20 | 17.72 | 3.03 | 135.49 |

## CADET-MIDSHIPMEN.

*Merit-roll of third class* (81 *members*), *annual examination, June,* 1879.

| Order of annual merit. | Name. | Mathematics. | Chemistry. | History, composition, and rhetoric. | French. | Drawing. | Conduct. | Aggregate. |
|---|---|---|---|---|---|---|---|---|
| | Maxima | **72** | **32** | **24** | **16** | **8** | ........ | **152** |
| *1 | **J. L. Schock** | 74.88 | 29.04 | 20.76 | 11.96 | 7.72 | 0.77 | 143.59 |
| *2 | **J. L. Rees** | 70.92 | 27.36 | 21.60 | 12.40 | 7.80 | 1.22 | 138.86 |
| *3 | **F. C. Rider** | 71.28 | 28.88 | 19.32 | 11.52 | 7.82 | 0.45 | 138.37 |
| *4 | **J. H. Linnard** | 68.04 | 29.04 | 19.80 | 12.20 | 7.16 | 1.07 | 135.17 |
| *5 | **J. J. Woodward** | 68.58 | 27.20 | 20.46 | 10.84 | 7.44 | 0.48 | 134.04 |
| *6 | **J. A. Hoogewerff** | 66.60 | 27.76 | 19.38 | 12.08 | 7.32 | 0.50 | 132.64 |
| *7 | **F. E. Sutton** | .62.64 | 26.96 | 20.64 | 14.64 | 5.44 | 0.40 | 129.92 |
| 8 | R. B. Dashiell | 60.30 | 25.36 | 20.16 | 13.96 | 7.84 | 0.15 | 127.47 |
| 9 | T. Serata | 66.96 | 24.40 | 18.00 | 11.84 | 5.62 | 0.30 | 126.52 |
| 10 | H. K. White | 62.10 | 25.20 | 18.72 | 12.40 | 7.40 | 0.30 | 125.52 |
| 11 | E. Carroll | 63 72 | 23.84 | 19.14 | 11.96 | 7.18 | 0.90 | 124.94 |
| 12 | C. M. Perkins | 57.96 | 26.80 | 20.76 | 12.08 | 7.24 | 1.18 | 123.66 |
| 13 | L. Karmany | 58.14 | 25.76 | 19.02 | 14.08 | 6.64 | 0.55 | 123.09 |
| 14 | E. E. Capehart | 58.86 | 24.88 | 19.86 | 13.60 | 6.10 | 0.45 | 122.85 |
| 15 | W. H. Stayton | 60.12 | 25.76 | 19.14 | 11.64 | 5.50 | 1.62 | 120.54 |
| 16 | C. H. Lauchheimer | 57.06 | 25.12 | 18.00 | 13.92 | 5.52 | 0.89 | 118.73 |
| 17 | H. Eldredge | 55.98 | 23.44 | 20.34 | 13.08 | 5.84 | 0.44 | 118.24 |
| 18 | S. Uriu | 59.04 | 20.48 | 18.66 | 12.04 | 7.20 | 0.20 | 117.22 |
| 19 | C. A. Doyen | 54.54 | 24.48 | 19.32 | 13.32 | 6.32 | 0.97 | 117.01 |
| 20 | B. G. Pierce | 55.98 | 24.56 | 20.16 | 11.16 | 5.98 | 0.88 | 116.96 |
| 21 | F. E. Bunts | 55.80 | 23.04 | 18.72 | 12.48 | 6.54 | 0.26 | 116.32 |
| 22 | H. C. Haines | 56.70 | 23.36 | 18.18 | 11.56 | 7.62 | 1.15 | 116.27 |
| 23 | F. J. Moses | 56.34 | 23.44 | 18.36 | 11.80 | 6.70 | 1.14 | 115.50 |
| 24 | R. P. Forshew | 51.12 | 25.20 | 20.94 | 12.56 | 5.46 | 0.31 | 114.97 |
| 25 | J. E. Mahoney | 50.58 | 24.08 | 21.42 | 13.08 | 6.32 | 0.79 | 114.69 |
| 26 | F. H. Hunicke | 53.46 | 21.28 | 18.36 | 13.60 | 7.92 | 0.69 | 113.95 |
| 27 | H. B. Andrews | 54.18 | 22.16 | 17.88 | 13.40 | 6.66 | 0.39 | 113.89 |
| 28 | F. W. Smies | 52.20 | 23.76 | 18.30 | 11.76 | 7.68 | 0.59 | 113.11 |
| 29 | H. B. Wilson | 56.16 | 22.32 | 18.48 | 11.36 | 5.28 | 1.29 | 112.31 |
| 30 | G. Barnett | 51.30 | 24.08 | 18.90 | 10.88 | 5.88 | 0.32 | 110.72 |
| 31 | S. M. Kase | 53.10 | 21.60 | 17.58 | 12.08 | 6.54 | 0.48 | 110.42 |
| 32 | W. A. Gresham | 52.56 | 22.16 | 16.98 | 11.24 | 7 24 | 0.36 | 109.82 |
| 33 | W. F. Flournoy | 54.36 | 21.36 | 17.76 | 13.16 | 4.44 | 1.34 | 109.74 |
| 34 | O. E. Weller | 52.20 | 23.28 | 17.70 | 12.20 | 5.18 | 1.25 | 109.31 |
| 35 | C. W. Stewart | 48.60 | 24.88 | 17.22 | 12.56 | 6.86 | 0 86 | 109.26 |
| 36 | A. S. McCrea | 48.78 | 22.08 | 18.36 | 13.72 | 7.44 | 1.30 | 109.08 |
| 37 | J. A. Kimball | 49.68 | 24.48 | 16.80 | 11.88 | 6.56 | 0.85 | 108.55 |
| 38 | G. Clarke | 53.46 | 22.80 | 16.92 | 11.24 | 5.48 | 1.41 | 108.49 |
| 39 | R. P. Hains | 49.32 | 23.68 | 17.34 | 11.24 | 7.26 | 0.83 | 108.01 |
| 40 | G. M. Buck | 51.30 | 21.84 | 17.16 | 11.00 | 6.32 | 0.34 | 107.28 |
| 41 | H. L. Ballentine | 48.60 | 22.24 | 20.58 | 12.04 | 5.20 | 1.41 | 107.25 |
| 42 | J. H. Colwell | 50.94 | 21.60 | 18.12 | 11.56 | 5.46 | 0.57 | 107.11 |
| 43 | J. D. Crenshaw | 51.48 | 21.12 | 16.62 | 11.52 | 6.72 | 0.55 | 106.91 |
| 44 | R. R. Cockle | 50.40 | 22.16 | 18.12 | 11.32 | 6.22 | 1.50 | 106.72 |
| 45 | D. L. Printup | 49.68 | 23.04 | 17.46 | 11.12 | 6.10 | 1.24 | 106.16 |
| 46 | E. H. Harrison | 51.12 | 22.56 | 17.22 | 10.40 | 5.30 | 0.50 | 106.10 |
| 47 | G. G. Rodgers | 52.20 | 21.60 | 16.86 | 11.64 | 4.58 | 1.11 | 105.77 |
| 48 | G. P. Blow | 48.60 | 23.12 | 17.52 | 10.72 | 6.34 | 1.27 | 105.03 |
| 49 | C. P. George | 48.96 | 20.80 | 17.28 | 11.48 | 7.28 | 0.78 | 105.02 |
| 50 | S. Bryan | 48.24 | 22.56 | 17.64 | 11.72 | 5.72 | 0.91 | 104.97 |
| 51 | Z. B. Vance | 50.58 | 23.12 | 16.02 | 11.08 | 5.06 | 1.60 | 104.26 |
| 52 | J. W. Weeks | 48.96 | 20.32 | 18.00 | 11.36 | 5.86 | 0.34 | 104.16 |
| 53 | S. H. Wright | 48.78 | 20.72 | 16.98 | 11.56 | 6.84 | 0.91 | 103.97 |
| 54 | J. W. Dresser | 49.86 | 22.08 | 15.96 | 11.20 | 6.04 | 1.32 | 103.82 |
| 55 | W. M. Robinson | 48.42 | 22.56 | 16.68 | 10.84 | 5.64 | 0.97 | 103.17 |
| 56 | W. W. Russell | 46.26 | 21.92 | 16.92 | 14.52 | 5.30 | 1.77 | 103.15 |
| 57 | I. McJunkin | 46.44 | 21.20 | 18.06 | 12.00 | 5.56 | 0.24 | 103.02 |
| 58 | G. Wilkes | 47.16 | 22.48 | 16.98 | 11.28 | 6.20 | 1.15 | 102.95 |
| 59 | A. C. Parsons | 48.78 | 22.00 | 16.20 | 10.96 | 5.78 | 0.85 | 102.87 |
| 60 | H. R. Cohen | 46.80 | 20.96 | 17.16 | 10,92 | 6.70 | 0.36 | 102.18 |
| 61 | S. H. Williamson | 47.16 | 22.48 | 16.74 | 11.92 | 5.00 | 1.34 | 101.96 |
| 62 | M. A. Orlopp | 50.40 | 21.12 | 15.54 | 10.96 | 4.80 | 1.46 | 101.36 |
| 63 | M. J. Donnelly | 45.18 | 21.68 | 17.70 | 11.60 | 5.66 | 1.11 | 100.71 |
| 64 | D. Morgan | 46.80 | 22.00 | 15.66 | 11.12 | 5.16 | 0.94 | 99.80 |
| 65 | T. H. Mathews | 46.62 | 22.00 | 16.32 | 11.40 | 5.00 | 1.58 | 99.76 |
| 66 | G. E. Perry | 47.34 | 21.04 | 16.26 | 10.96 | 4.84 | 1.03 | 99.41 |
| 67 | E. M. Harmon | 45.72 | 21.04 | 17.46 | 11.00 | 5.74 | 1.68 | 99.28 |

CADET-MIDSHIPMEN—Continued.

*Merit-roll of third class* (81 *members*), *annual examination, June*, 1879.

| Order of annual merit. | Name. | Mathematics. | Chemistry. | History, composition, and rhetoric. | French. | Drawing. | Conduct. | Aggregate. |
|---|---|---|---|---|---|---|---|---|
| | Maxima | **72** | **32** | **24** | **16** | **8** | ... .. | **152** |
| 68 | B. H. Craig | 44.64 | 20.96 | 16.98 | 11.12 | 5.44 | 1.14 | 98.00 |
| 69 | A. R. Hasson | 41.22 | 22.24 | 17.16 | 11.08 | 7.36 | 1.18 | 97.88 |
| 70 | W. G. Ford | 46.08 | 21.92 | 15.96 | 10.00 | 5.10 | 1.30 | 97.76 |
| 71 | A. C. Oliphant | 45.00 | 20.08 | 16.08 | 10.56 | 5.68 | 0.43 | 96.97 |
| 72 | L. T. McKee | 45.90 | 20.88 | 15.60 | 10.72 | 4.74 | 1.14 | 96.70 |
| 73 | J. H. Lindsey | 46.08 | 20.40 | 15.30 | 11.00 | 5.32 | 1.50 | 96.60 |
| † | W. L. Emmett | 47.16 | 24.24 | 16.38 | 9.52 | 7.54 | 1.65 | 103.19 |
| † | M. Craven | 44.28 | 20.24 | 15.96 | 11.36 | 7.68 | 1.32 | 98.20 |
| † | F. Parker | 40.68 | 20.00 | 16.68 | 14.40 | 7.68 | 1.60 | 97.84 |
| † | T. L. Bonfils | 43.56 | 20.88 | 16.62 | 10.40 | 5.24 | 0.89 | 95.81 |
| § | J. P. Porter | 42.30 | 20.32 | 16.08 | 11.16 | 5.56 | 0.83 | 94.59 |
| § | E. W. Foster | 43.92 | 20.64 | 15.48 | 9.76 | 5.08 | 1.72 | 93.16 |
| | S. Enouye | 34.20 | 12.24 | 10.62 | ........ | 5.98 | 0.06 | 62.98 |
| § | R. R. Gurley | *a* | *a* | *a* | *a* | *a* | 0.21 | ........ |

## CADET-MIDSHIPMEN.

### *Merit-roll of fourth class (73 members), annual examination, June, 1879.*

| Order of annual merit. | Name. | Mathematics. | Drawing. | History and English. | French. | Conduct. | Aggregate. |
|---|---|---|---|---|---|---|---|
| | Maxima | **36** | **8** | **24** | **8** | .... | **76** |
| *1 | **Lewis Nixon** | 36.36 | 6.62 | 20.10 | 6 14 | 0.25 | 68.97 |
| *2 | **John T. Arnold** | 34.20 | 7.20 | 18.84 | 5.78 | 0.77 | 65.25 |
| *3 | **Lewis S. Bennett** | 31.77 | 6.50 | 21.12 | 6.56 | 0.71 | 65.24 |
| 4 | William B. Fletcher | 30.60 | 7.30 | 20.40 | 5.66 | 0.41 | 63.55 |
| 5 | William T. Paine | 33.66 | 5.36 | 17.94 | 6.64 | 0.32 | 63.28 |
| 6 | John M. Poyer | 31.86 | 5.94 | 19.74 | 5.74 | 0.96 | 62.32 |
| 7 | Finley A. McNutt | 29.70 | 5.54 | 21.18 | 6.74 | 0.90 | 62.26 |
| 7 | Jacob G. McWhorter | 32.85 | 5.92 | 18.42 | 5.92 | 0.85 | 62.26 |
| 9 | William M. Howard | 30.15 | 6.74 | 18.78 | 6.76 | 0.29 | 62.14 |
| 10 | Spencer S. Wood | 29.16 | 6.92 | 19.62 | 5.84 | 0.14 | 61.40 |
| 11 | Wiley R. M. Field | 30.78 | 5.94 | 17.58 | 6.74 | 0.40 | 60.64 |
| 12 | Albert L. Key | 31.05 | 5.38 | 18.78 | 6.02 | 1.06 | 60.17 |
| 13 | Clarence Martin | 30.51 | 5.46 | 17.82 | 6.46 | 0.31 | 59.94 |
| 14 | William Y. Slack | 28.53 | 6.74 | 18.00 | 5.82 | 0.14 | 58.95 |
| 15 | Frederick H. Stahle | 27.99 | 6.40 | 19.02 | 5.96 | 0.94 | 58.43 |
| 16 | Harold H. Eames | 28.17 | 7.14 | 17.76 | 5.94 | 0.66 | 58.35 |
| 17 | William J. Grambs | 29.79 | 6.60 | 17.52 | 5.40 | 0.97 | 58.34 |
| 18 | Marbury Johnston | 28.98 | 5.48 | 18.24 | 6.08 | 0.49 | 58.29 |
| 19 | Herman H. Kenkel | 29.07 | 7.36 | 16.32 | 5.62 | 0.20 | 58.17 |
| 20 | James G. Doyle | 28.26 | 7.26 | 17.64 | 5.62 | 0.65 | 58.13 |
| 21 | Lorenzo Semple | 27.45 | 5.48 | 18.60 | 6.76 | 0.86 | 57.43 |
| 22 | Henry A. Horst | 26.10 | 6.54 | 18.06 | 6.80 | 0.30 | 57.20 |
| 23 | Joseph L. Jayne | 28.53 | 6.60 | 17.16 | 5.14 | 0.48 | 56.95 |
| 24 | Edson W. Sutphen | 27.27 | 7.06 | 17.70 | 5.28 | 0.46 | 56.85 |
| 25 | William B. Whittelsey | 27.18 | 6.88 | 16.80 | 5.34 | 0.16 | 56.04 |
| 26 | Edwin A. Anderson | 24.84 | 7.00 | 18.06 | 6.24 | 0.39 | 55.75 |
| 27 | Thomas C. Prince | 25.47 | 6.82 | 17.64 | 5.42 | 0.27 | 55.08 |
| 28 | John J. Conway | 25.65 | 5.28 | 18.78 | 5.82 | 0.58 | 54.95 |
| 29 | Charles J. Dudley | 27.18 | 6.10 | 16.32 | 5.82 | 0.63 | 54.79 |
| 30 | John J. Blandin | 25.56 | 6.00 | 18.12 | 5.80 | 0.72 | 54.76 |
| 31 | John R. Miner | 25.11 | 6.64 | 18.30 | 5.60 | 0.91 | 54.74 |
| 32 | John A. Lamkin | 26.64 | 5.16 | 17.76 | 5.56 | 0.68 | 54.44 |
| 33 | Ledru R. Savage | 24.93 | 6.50 | 17.64 | 5.50 | 0.16 | 54.41 |
| 34 | George E. Kent | 27.09 | 6.62 | 16.20 | 5.34 | 0.93 | 54.32 |
| 35 | Nathaniel M. Hubbard | 26.37 | 7.04 | 16 68 | 5.22 | 1.00 | 54.31 |
| 36 | Philo N. McGiffin | 25.83 | 6.38 | 17.22 | 5.34 | 0.94 | 53.83 |
| 37 | Lawrence S. Gwyn | 24.75 | 6.00 | 16.92 | 5.98 | 0.21 | 53.44 |
| 38 | Robert B. Blake | 24.57 | 5.40 | 16.56 | 7.54 | 0.96 | 53.11 |
| 39 | Everett N. Bell | 23.31 | 6.52 | 18.06 | 5.28 | 0.42 | 52.75 |
| 40 | Thomas W. Hayden | 25.20 | 5.28 | 16.08 | 6.14 | 0.90 | 51.80 |
| 41 | Hammond Fowler | 23.67 | 5.78 | 16.92 | 5.90 | 0.51 | 51.76 |
| 42 | James W. Smythe | 25.29 | 6.18 | 15.42 | 5.46 | 0.60 | 51.75 |
| 43 | Walter E. Morris | 23.58 | 7.22 | 15.96 | 5.14 | 0.53 | 51.37 |
| 44 | Sidney H. Dent | 23.40 | 6.86 | 16.38 | 5.06 | 0.36 | 51.34 |
| 45 | William P. Hoke | 24.03 | 4.94 | 17.70 | 5.66 | 1.10 | 51.23 |
| 46 | Samuel A. W. Patterson | 25.38 | 5.26 | 16.20 | 5.42 | 1.05 | 51.21 |
| 47 | Oliver D. Norton | 24.30 | 5.80 | 16.08 | 5.14 | 0.43 | 50.89 |
| 48 | Frank F. E. Lodeman | 23.22 | 5.74 | 16.08 | 6.02 | 0.94 | 50.12 |
| 49 | George M. von Schrader | 22.77 | 5.56 | 15.12 | 5.20 | 0.54 | 48.11 |
| 50 | Stephen Ashby | 23.13 | 5.00 | 15.06 | 5.14 | 0.60 | 47.73 |
| † | William B. Duncan | 25.47 | 5.70 | 14.70 | 7.16 | 0.98 | 52.05 |
| ‡ | Patrick H. Philbin | 22.77 | 5.60 | 14.34 | 5.28 | 0.16 | 47.83 |
| ‡ | Edwin B. Weeks | 22.14 | 5.36 | 14.34 | 5.76 | 0.94 | 46.66 |
| ‡ | Charles F. Hepp | 20.52 | 6.66 | 15.30 | 5.08 | 0.17 | 47.39 |
| § | Charles T. Phythian | 20.52 | 6.06 | 15.12 | 5.14 | 0.52 | 46.32 |
| ‡ | Thomas H. Gignilliat | 19.89 | 6.76 | 15.18 | 4.20 | 0.56 | 45.47 |
| † | John H. Barnard | 20.16 | 6.54 | 13.80 | 5.00 | 0.30 | 45.20 |
| ‡ | Charles R. Reynolds | 19.17 | 5.14 | 12.06 | 4.82 | 0.25 | 40.94 |
| ‡ | Alexander B. Legarè | 17.73 | 5.48 | 12.72 | 5.26 | 0.33 | 40.86 |
| ‡ | Robert H. Woods | 19.26 | ........ | 16.86 | ........ | 0.16 | 35.98 |
| ‡ | Willie T. Gray | 17.64 | ........ | 15.30 | ........ | 0.46 | 32.48 |
| ‡ | Elton W. Dalrymple | 18.09 | ........ | 14.10 | ........ | 0.67 | 31.52 |
| ‡ | Sidney Z. Mitchell | 16.47 | ........ | 15.18 | ........ | 0.34 | 31.31 |
| ‡ | William W. Rickets | 18.00 | ........ | 13.56 | ........ | 0.28 | 31.28 |
| ‡ | James F. Carpenter | 15.93 | ........ | 14.04 | ........ | 0.41 | 29.56 |
| † | Harry Rankin | 15.39 | ........ | 13.74 | ........ | 1.01 | 28.12 |
| † | Thomas B. Smith | 14.49 | ........ | 14.34 | ........ | 1.24 | 27.59 |
| † | John K. Morris | 10.71 | ........ | 16.56 | ........ | 0.21 | 27.06 |
| † | Arthur Dovalè | 14.13 | ........ | 12.72 | ........ | 0.38 | 26.47 |
| † | Edward E. Solomon | 12.96 | ........ | 13.50 | ........ | 0.70 | 25.76 |
| § | Joseph L. Wickes | 9.45 | ........ | 10.20 | ........ | 1.18 | 18.47 |
| † | Samuel E. Belford | 9.99 | ........ | 8.94 | ........ | 1.05 | 17.88 |
| † | Smith Salisbury | 10.26 | ........ | 7.80 | ........ | 0.84 | 17.22 |

## CADET-ENGINEERS.

*Merit-roll of first class (23 members), annual examination, June, 1879, and general merit-roll for four years.*

| Order of general merit. | Name. | Naval construction. | Steam-engineering. | Light and heat. | Physical measurements. | Mechanics. | Naval architecture. | Law. | Spanish. | Conduct. | Aggregate for fourth year. | Aggregate for third year. | Aggregate for second year. | Aggregate for first year. | General aggregate for four years. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maxima | **16** | **144** | **32** | **28** | **36** | **24** | **12** | **12** | | **304** | **228** | **152** | **76** | **760** |
| *1 | **Richard Gatewood** | 12. 76 | 131. 76 | 27. 84 | 21. 00 | 32. 85 | 26. 72 | 11. 04 | 10. 65 | 1. 41 | 273. 21 | 202. 52 | 135. 30 | 68. 85 | 679. 88 |
| *2 | **Walter M. McFarland** | 12. 04 | 123. 12 | 28. 88 | 24. 50 | 32. 76 | 26. 35 | 10. 41 | 10. 89 | 1. 62 | 267. 33 | 204. 91 | 138. 80 | 66. 80 | 677. 84 |
| *3 | **Francis T. Bowles** | 13. 88 | 126. 72 | 26. 40 | 24. 50 | 31. 23 | 25. 86 | 10. 80 | 9. 27 | 1. 59 | 267. 07 | 197. 77 | 135. 74 | 62. 76 | 663. 34 |
| 4 | Benjamin C. Bryan | 12. 56 | 123. 12 | 25. 60 | 28. 00 | 33. 03 | 24. 67 | 9. 87 | 9. 48 | 1. 74 | 264. 59 | 189. 55 | 121. 92 | 58. 96 | 635. 02 |
| 5 | Charles B. Lubbe | 12. 76 | 119. 88 | 25. 20 | 28. 00 | 26. 19 | 25. 02 | 9. 69 | 9. 30 | 1. 98 | 254. 06 | 182. 69 | 120. 05 | 58. 70 | 615. 50 |
| 6 | Clarence A. Carr | 11. 64 | 117. 36 | 26. 32 | 21. 00 | 31. 05 | 24. 25 | 9. 72 | 10. 23 | 1. 68 | 249. 89 | 186. 09 | 122. 14 | 56. 73 | 614. 85 |
| 7 | Andrew M. Hunt | 11. 92 | 119. 16 | 23. 84 | 28. 00 | 23. 94 | 23. 06 | 9. 69 | 10. 62 | 1. 41 | 248. 82 | 177. 77 | 113. 84 | 59. 71 | 600. 14 |
| 8 | Edward O. Acker | 12. 60 | 118. 08 | 28. 72 | 28. 00 | 25. 11 | 21. 59 | 10. 71 | 8. 49 | 0. 87 | 252. 43 | 172. 49 | 113. 79 | 56. 65 | 595. 36 |
| 9 | John W. Annan | 11. 44 | 114. 84 | 23. 44 | 26. 60 | 25. 47 | 16. 62 | 9. 63 | 8. 79 | 3. 54 | 233. 29 | 169. 80 | 109. 15 | 59. 08 | 571. 32 |
| 10 | Henry K. Ivers | 11. 64 | 106. 56 | 21. 52 | 23. 80 | 25. 83 | 21. 77 | 9. 30 | 8. 52 | 2. 85 | 226. 09 | 178. 04 | 104. 06 | 54. 94 | 563. 13 |
| 11 | Harold P. Norton | 13. 92 | 111. 24 | 20. 88 | 21. 00 | 26. 01 | 16. 74 | 9. 84 | 7. 89 | 1. 29 | 226. 23 | 166. 38 | 106. 69 | 57. 18 | 556. 48 |
| 12 | Frank M. Bennett | 11. 00 | 105. 84 | 20. 40 | 21. 00 | 24. 39 | 18. 48 | 10. 53 | 7. 89 | 2. 43 | 217. 10 | 162. 05 | 108. 43 | 61. 10 | 548. 68 |
| 13 | Harry S. Elseffer | 11. 20 | 108. 00 | 20. 64 | 27. 30 | 23. 22 | 16. 80 | 8. 94 | 8. 64 | 1. 32 | 223. 42 | 163. 89 | 101. 20 | 58. 95 | 547. 46 |
| 14 | Charles G. Talcott | 11. 96 | 112. 32 | 21. 28 | 26. 60 | 23. 76 | 17. 34 | 9. 06 | 8. 19 | 2. 91 | 227. 60 | 164. 09 | 101. 14 | 53. 21 | 546. 04 |
| 15 | John U. Crygier | 12. 72 | 110. 88 | 21. 44 | 19. 60 | 23. 85 | 16. 86 | 9. 87 | 8. 52 | 1. 65 | 222. 09 | 161. 80 | 107. 42 | 54. 50 | 545. 81 |
| 16 | Richard T. Isbester | 11. 92 | 100. 44 | 22. 72 | 24. 50 | 26. 73 | 19. 01 | 9. 69 | 8. 25 | 3. 03 | 220. 23 | 165. 16 | 105. 99 | 51. 39 | 542. 77 |
| 17 | Edward H. Scribner | 11. 96 | 108. 36 | 20. 80 | 21. 00 | 24. 21 | 16. 14 | 8. 49 | 8. 07 | 1. 86 | 217. 17 | 158. 99 | 103. 30 | 57. 02 | 536. 48 |
| 18 | Martin Bevington | 12. 44 | 106. 20 | 21 12 | 21. 00 | 24. 93 | 17. 04 | 9. 84 | 7. 50 | 2. 16 | 217. 91 | 158. 18 | 101. 94 | 52. 88 | 530. 91 |
| 19 | Frederic C. Bowers | 11. 28 | 102. 24 | 21. 36 | 18. 20 | 25. 83 | 18. 48 | 9. 48 | 9. 03 | 2. 73 | 213. 17 | 157. 64 | 101. 61 | 51. 83 | 524. 25 |
| 20 | George R. Salisbury | 11. 48 | 98. 28 | 20. 08 | 21. 70 | 23. 31 | 17. 40 | 8. 28 | 8. 58 | 1. 35 | 207. 76 | 156. 67 | 98. 99 | 56. 99 | 520. 41 |
| 21 | Joseph M. Pickrell | 11. 12 | 101. 88 | 20. 80 | 18. 20 | 25. 83 | 17. 40 | 9. 03 | 8. 10 | 3. 48 | 208. 88 | 151. 59 | 97. 80 | 54. 36 | 512. 63 |
| 22 | John H. Baker | 10. 28 | 98. 64 | 20. 48 | 17. 50 | 24. 30 | 16. 92 | 8. 91 | 7. 77 | 2. 88 | 201. 92 | 155. 44 | 97. 85 | 52. 10 | 507. 31 |
| 23 | Thomas F. Carter | 11. 32 | 99. 36 | 20. 56 | 17. 50 | 23. 85 | 16. 38 | 9. 69 | 8. 13 | 1. 53 | 205. 26 | 154. 36 | 97. 33 | 49. 91 | 506. 86 |

## CADET-ENGINEERS.

*Merit-roll of second class* (18 *members*), *annual examination, June,* 1879.

| Order of annual merit. | Name. | Steam-engineering. | Astronomy. | Electricity. | Mechanics and applied mathematics. | Composition. | French. | Conduct. | Aggregate. |
|---|---|---|---|---|---|---|---|---|---|
| | Maxima | **76** | **24** | **24** | **56** | **20** | **28** | ...... | **228** |
| *1 | **Albert W. Stahl** | 68.40 | 21.48 | 22.38 | 51.24 | 19.30 | 24.89 | 1.59 | 206.10 |
| *2 | **William F. Durand** | 67.26 | 21.36 | 21.54 | 55.16 | 17.75 | 23.34 | 1.31 | 205.10 |
| 3 | William F. C. Hasson | 62.13 | 19.74 | 18.18 | 51.66 | 17.70 | 24.32 | 1.83 | 191.90 |
| 4 | Leo D. Miner | 63.84 | 18.36 | 20.64 | 50.96 | 15.65 | 18.49 | 0 27 | 187.67 |
| 5 | Winfield S. Sample | 62.51 | 17.40 | 17.70 | 47.74 | 16.00 | 20.12 | 1.00 | 180.47 |
| 6 | Arthur T. Woods | 63.46 | 20.04 | 16.50 | 41.86 | 16.50 | 22.58 | 1.35 | 179.59 |
| 7 | Joseph L. Wood | 57.57 | 16.02 | 20.04 | 43.40 | 16.05 | 26.10 | 0.92 | 178.26 |
| 8 | William H. Allderdice | 57.95 | 16.02 | 15.54 | 45.36 | 19.55 | 20.80 | 2.48 | 172.74 |
| 9 | Charles E. Manning | 59.85 | 17.58 | 19.08 | 37.94 | 18.35 | 19.52 | 0.92 | 171.40 |
| 10 | Albert O. Young | 58.14 | 17.34 | 15.90 | 39.48 | 16.05 | 22.34 | 0.78 | 168.47 |
| 11 | Albert E. Smith | 60.23 | 17.46 | 16.74 | 38.36 | 16.95 | 19.96 | 1.65 | 168.05 |
| 12 | Charles A. King | 56.81 | 16.68 | 17.52 | 40.04 | 17.55 | 20.54 | 1.52 | 167.62 |
| 13 | Thomas W. Kinkaid | 56.62 | 16.44 | 19.08 | 37.38 | 16.95 | 21.45 | 0.62 | 167.30 |
| 14 | Harry Hall | 54.91 | 17.22 | 17.94 | 38.78 | 16.90 | 20.53 | 0.44 | 165.84 |
| 15 | Clarence H. Mathews | 55.10 | 16.74 | 16.74 | 38.92 | 16.20 | 18.37 | 1.16 | 160.91 |
| 16 | John L. Worthington | 53.39 | 15.00 | 15.06 | 36.12 | 16.65 | 22.25 | 0.55 | 157.92 |
| 17 | William D. Weaver | 53.77 | 15.24 | 16.56 | 35.98 | 17.55 | 21.14 | 2.69 | 157.55 |
| 18 | William S. Smith | 52.44 | 14.28 | 17.04 | 36.68 | 15.35 | 20.87 | 1.64 | 155.02 |
| ‡ | Charles E. Belden | 53.58 | 15.96 | 14.46 | 34.16 | 13.80 | 19.71 | 0.74 | 150.93 |
| † | Thomas J. Hogan | 53.77 | 13.80 | 15.24 | 33.74 | 15.20 | 18.82 | 1.82 | 148.75 |
| § | Clarence A. Miller | 50.35 | 14 16 | 12.72 | 30.80 | 15.75 | 18.41 | 2.01 | 140.18 |
| § | Frederick M. Lillebridge | 49.59 | 13.32 | 10.86 | 22.12 | 16.20 | 21.04 | 1.88 | 131.25 |

## CADET-ENGINEERS.

*Merit-roll of third class* (28 *members*), *annual examination, June,* 1879.

| Order of annual merit. | Name. | Mathematics. | Physics and chemistry. | History and rhetoric. | French. | Drawing. | Conduct. | Aggregate. |
|---|---|---|---|---|---|---|---|---|
| | Maxima | **72** | **32** | **24** | **16** | **8** | .... . | **152** |
| 1 | Gustave Kaemmerling | 61.02 | 24.24 | 18.24 | 11.92 | 6.94 | 0.70 | 121.66 |
| 2 | Jay M. Whitham | 61.38 | 23.12 | 18.60 | 10.56 | 5.92 | 0.37 | 119.21 |
| 3 | Oliver B. Shallenberger | 52.74 | 27.60 | 17.76 | 11.32 | 6.72 | 0.74 | 115.40 |
| 4 | Llewellyn F. Whittle | 51.84 | 24.00 | 20.28 | 13.48 | 6.22 | 1.31 | 114.51 |
| 5 | Lloyd Bankson | 53.28 | 25.12 | 17.76 | 11.40 | 6.42 | 0.69 | 113.29 |
| 6 | Frank B. Dowst | 50.94 | 24.56 | 18.30 | 12.88 | 6.34 | 0.98 | 112.04 |
| 7 | James E. Byrne | 52.74 | 25.04 | 17.10 | 11.08 | 6.56 | 1.00 | 111.52 |
| 8 | Isaac B. Parsons | 55.08 | 23.20 | 16.56 | 10.32 | 7.50 | 1.24 | 111.42 |
| 9 | Bias C. Sampson | 55.80 | 21.36 | 17.40 | 10.64 | 5.94 | 0.83 | 110.31 |
| 10 | Kenneth McAlpine | 52.02 | 21.36 | 18.00 | 13.08 | 6.16 | 0.92 | 109.70 |
| 11 | William T. Webster | 52.38 | 22.08 | 17.94 | 11.24 | 6.24 | 0.92 | 108.96 |
| 12 | Robert Stewart, jr | 48.06 | 23.12 | 20.40 | 12.20 | 5.52 | 0.59 | 108.71 |
| 13 | Lyman B. Perkins | 51.12 | 23.92 | 16.80 | 10.76 | 6.92 | 1.04 | 108.48 |
| 14 | William Lang | 48.78 | 21.92 | 20.04 | 12.08 | 6.04 | 0.61 | 108.25 |
| 15 | De Witt C. Redgrave | 51.66 | 22.64 | 16.68 | 10.80 | 6.52 | 0.67 | 107.63 |
| 16 | Herman Eckel | 46.26 | 23.52 | 18.84 | 13.20 | 5.46 | 0.31 | 106.97 |
| 17 | Solon Arnold | 47.52 | 21.60 | 19.92 | 12.36 | 5.72 | 0.69 | 106.43 |
| 18 | William W. White | 52.20 | 22.16 | 16.68 | 10.56 | 5.84 | 1.03 | 106.41 |
| 19 | Arthur R. Bush | 50.94 | 22.32 | 15.84 | 11.24 | 7.14 | 1.49 | 105.99 |
| 20 | Martin A. Anderson | 49.32 | 20.88 | 16.86 | 12.08 | 7.48 | 1.12 | 105.50 |
| 21 | William S. Smith | 48.06 | 22.00 | 18.00 | 10.12 | 6.96 | 0.71 | 104.43 |
| 22 | William H. Gartley | 48.60 | 21.60 | 17.16 | 11.24 | 6.46 | 1.20 | 103.86 |
| 23 | Albert Moritz | 47.88 | 20.56 | 15.96 | 11.48 | 6.08 | 0.57 | 101.39 |
| 24 | Robert J. Beach | 46.44 | 20.56 | 17.28 | 10.52 | 7.08 | 1.20 | 100.68 |
| † | Andrew McAllister | 44.46 | 20.16 | 18.42 | 10.92 | 6.00 | 0.89 | 99.07 |
| ‡ | Willis B. Day | 43.56 | 20.72 | 16.26 | 10.04 | 5.72 | 0.68 | 95.62 |
| § | Arthur Nichols | 39.42 | 16.24 | 15.78 | 11.28 | 6.42 | 0.84 | 88.30 |
| § | Harry R. McCreary | 37.80 | 19.20 | 15.72 | 10.00 | 5.04 | 1.29 | 86.47 |

## CADET-ENGINEERS.

*Merit-roll of fourth class* (28 *members*), *annual examination, June*, 1879.

| Order of annual merit. | Name. | Mathematics. | English and history. | French. | Drawing. | Conduct. | Aggregate. |
|---|---|---|---|---|---|---|---|
| | Maxima | **36** | **24** | **8** | **8** | ........ | **76** |
| *1 | **Emil Theiss** | 33. 75 | 22. 26 | 8. 04 | 6. 60 | 0. 62 | 70. 03 |
| *2 | **Willian H. P. Creighton** | 34. 92 | 21. 66 | 6. 30 | 6. 54 | 0. 29 | 69. 13 |
| *3 | **James H. Fitts** | 32. 40 | 20. 64 | 7. 78 | 6. 28 | 0. 30 | 66. 80 |
| *4 | **Robert W. Gatewood** | 34. 38 | 18. 84 | 7. 52 | 5. 92 | 0. 62 | 66. 04 |
| 5 | William H. Chambers | 31. 41 | 21. 18 | 5. 84 | 6. 48 | 0. 34 | 64. 57 |
| 6 | Peter Miller | 32. 67 | 19. 56 | 5. 88 | 5. 76 | 0. 44 | 63. 43 |
| 7 | Arthur H. Clarke | 31. 68 | 20. 34 | 6. 16 | 5. 64 | 0. 40 | 63. 42 |
| 8 | Harry L. Hawthorne | 30. 96 | 19. 74 | 5. 54 | 6. 84 | 0. 37 | 62. 71 |
| 9 | George R. Ferguson | 32. 58 | 17. 46 | 5. 48 | 7. 30 | 0. 20 | 62. 62 |
| 10 | Charles E. Rommell | 30. 87 | 18. 96 | 5. 78 | 6. 82 | 0. 18 | 62. 25 |
| 11 | Frank H. Conant | 29. 61 | 19. 26 | 5. 70 | 5. 92 | 0. 32 | 60. 17 |
| 12 | Joseph H. Pendleton | 30. 60 | 17. 88 | 5. 30 | 6. 04 | 0. 60 | 59. 22 |
| 13 | Robert B. Higgins | 28. 44 | 17. 04 | 6. 02 | 6. 56 | 0. 47 | 57. 59 |
| 14 | Charles H. Howland | 26. 82 | 19. 62 | 5. 70 | 5. 90 | 0. 46 | 57. 58 |
| 15 | Otto C. Gsantner | 26. 91 | 17. 16 | 6. 14 | 7. 20 | 0. 90 | 56. 51 |
| 16 | Herbert P. Prevear | 26. 73 | 16. 44 | 6. 28 | 7. 56 | 0. 65 | 56. 36 |
| 17 | John C. Leonard | 26. 91 | 18. 18 | 5. 64 | 5. 70 | 0. 43 | 56. 00 |
| 18 | Clarence C. Willis | 24. 84 | 18. 90 | 5. 96 | 5. 72 | 0. 34 | 55. 08 |
| 19 | Isaac H. Quinby | 27. 90 | 15. 96 | 5. 68 | 6. 58 | 1. 10 | 55. 02 |
| 20 | Ward P. Winchell | 24. 48 | 18. 00 | 5. 30 | 7. 36 | 0. 24 | 54. 90 |
| 21 | Henry L. Simpson | 26. 10 | 16. 80 | 5. 16 | 6. 70 | 0. 46 | 54. 30 |
| 22 | Walter R. Addicks | 24. 21 | 17. 82 | 5. 24 | 6. 58 | 0. 48 | 53. 37 |
| 23 | Daniel D. Gladstone | 25. 02 | 17. 04 | 5. 74 | 6. 58 | 1. 04 | 53. 34 |
| 24 | Frederick E. Coley | 24. 75 | 16. 02 | 5. 16 | 6. 80 | 0. 88 | 51. 85 |
| 25 | Edward K. Taylor | 23. 76 | 15. 78 | 5. 30 | 6. 54 | 0. 42 | 50. 96 |
| † | Harry G. Leopold | 24. 21 | 16. 26 | 4. 80 | 6. 70 | 0. 94 | 51. 03 |
| † | Thomas A. W. Shock | 23. 40 | 14. 76 | 5. 24 | 5. 68 | 0. 22 | 48. 86 |
| | Sadanori Youchi | 18. 00 | 11. 22 | ........ | 6. 30 | 0. 04 | 35. 48 |

# REGULATIONS

GOVERNING

# HE ADMISSION OF CANDIDATES INTO THE NAVAL ACADEMY AS CADET-MIDSHIPMEN.

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## NOMINATION.

I. The number of Cadet-Midshipmen allowed at the Academy is one for every Mem-er and Delegate of the House of Representatives; one for the District of Columbia; nd ten appointed at large. According to the act of Congress approved June 17, 878, "There shall not be at any time more in said Academy appointed at large than en." As it will take some time before the number now at the Academy can be reduced o ten, there will be no appointment at large for at least two years to come.

II. The nomination of candidates for admission from the District of Columbia and t large is made by the President. The nomination of a candidate from any Congres-ional district or Territory is made on the recommendation of the Member or Delegate rom actual residents of his district or Territory.

III. Each year, as soon after the 5th of March as possible, Members and Delegates will be notified in writing of vacancies that may exist in their districts. If such Mem-ers or Delegates neglect to recommend candidates by the 1st of July in that year, the ecretary of the Navy is required by law to fill the vacancies existing in districts actu-lly represented in Congress. They will be filled by appointments from the districts n which the vacancies exist.

IV. The nomination of candidates is made annually between the 5th of March and he 1st of July. Candidates who are nominated in time to enable them to reach the cademy on the 11th of June will receive permission to present themselves at that time o the Superintendent of the Naval Academy, for examination as to their qualifications or admission. Those who are nominated prior to July 1, but not in time to attend the une examination, will be examined on the 22d of September following; and should ny candidate fail to report, or be found physically or mentally disqualified for admis-ion, in June, the Member or Delegate from whose district he was nominated will be otified to recommend another candidate, who shall be examined on the 22d of Sep-ember following. When any of the dates assigned for examinations fall on Sunday, he examination will take place on the following Monday.

V. A sound body and healthy constitution, good mental abilities, a natural aptitude or study and habits of application, persistent effort, an obedient and orderly disposi-ion, and correct moral principles and deportment, are so necessary to success in pur-ning the course at the Academy, that persons conscious of any deficiency in these espects are earnestly recommended not to subject themselves or their friends to the ortification and disappointment consequent upon failure, by accepting nominations nd attempting to enter a service for which they are not fitted.

## EXAMINATION.

VI. Each candidate for appointment as Cadet-Midshipman must present to the cademic Board satisfactory testimonials of good moral character, and must certify *on onor* to his precise age, which must be over fourteen and less than eighteen years at he time of the examination. No candidate will be examined whose age does not fall within the prescribed limits.

VII. Candidates must be physically sound, well formed, and of robust constitution;

they will be required to pass a satisfactory examination before a medical board composed of the surgeon of the Naval Academy and two other medical officers to be designated by the Secretary of the Navy.

VIII. Any *one* of the following conditions will be sufficient to cause the rejection of a candidate:

Feeble constitution, inherited or acquired;
Greatly-retarded development;
Permanently-impaired general health;
Decided cachexia, diathesis, or predisposition;
All chronic diseases or results of injuries that would permanently impair efficiency, viz:
Weak or disordered intellect;
Cutaneous and communicable diseases;
Unnatural curvature of spine, torticollis, or other deformity;
Permanent inefficiency of either of the extremities or articulations from any cause;
Epilepsy or other convulsions within five years;
Impaired vision, or chronic disease of the organs of vision;
Great hardness of hearing or chronic disease of the ears;
Chronic nasal catarrh, ozæna, polypi, or great enlargement of the tonsils;
Impediment of speech to such an extent as to impair efficiency in the performance of duty;
Chronic diseases of heart or lungs, or decided indications of liability to cardiac or pulmonary affections;
Hernia or retention of testes in inguinal cavity;
Sarcocele, hydrocele, stricture, fistula, or hæmorrhoids;
Large varicose veins of lower limbs, scrotum, or cord;
Chronic ulcers.

Attention will also be paid to the stature of the candidate; and no one *manifestly* under size for his age will be received into the Academy. In case of doubt about the physical condition of the candidate, any marked deviation from the usual standard of height will add materially to the consideration for rejection. Five feet will be the minimum height for the candidate.

The board will exercise a proper discretion in the application of the above conditions to each case, rejecting no candidate who is likely to be efficient in the service, and admitting no one who is likely to prove physically inefficient. No candidate rejected by the board will be allowed a re-examination.

IX. The candidates must pass a satisfactory examination before the Academic Board in reading, writing, spelling, arithmetic, geography, and English grammar.

X. All the examinations, except in reading, will be written. Candidates who fall below the standard will receive a second and final examination in the subjects in which they fail. Deficiency in any one of the subjects at the second examination will be sufficient to insure rejection.

XI. "Candidates rejected at such examinations shall not have the privilege of another examination for admission to the same class unless recommended by the Board of Examiners."—(*Rev. Stat.*, § 1515.)

### GENERAL CHARACTER OF THE QUESTIONS.

XII. ARITHMETIC.—*Notation and numeration.*—The candidate is required to express in figures any whole number, decimal, or mixed number; to write in words any given number; and to explain the Roman and Arabic systems of notation.

*Denominate numbers.*—The tables of money, weights, and measures in common use, including English money; addition, subtraction, multiplication, and division of denominate numbers; the relation existing between the troy and avoirdupois pound; number of cubic inches in a gallon; reduction of differences of longitude to their equivalents in time, and *vice versa.*

*Fractions.*—The candidate must be familiar with all the processes of common and decimal fractions, and is expected to be able to give clearly the reasons for such processes, and to be familiar with the contracted methods of multiplication and division given in the ordinary text-books on arithmetic.

*Properties of numbers.*—Test of divisibility of numbers by 2, 3, 5, 8, 9, 11, 25, 125, &c. ; the resolution of composite numbers into prime factors; the method of determining whether any number is prime or composite, and of finding the greatest common divisor and the least common multiple of large as well as of small numbers.

*Ratio and proportion.*—Definitions and explanations of the nature of ratio and proportion; different methods of writing a proportion; solution of problems in simple and compound proportion.

*Percentage, interest, and discount.*—Examples usually given under these heads in arithmetics.

*Mensuration.*—The measurement of rectangular surfaces and volumes.

*Evolution.*—The extraction of square and cube roots.

*Analysis.*—Miscellaneous problems usually classed under this head, similar to those found in school arithmetics. It is essential that the candidate shall be thoroughly proficient in all branches of arithmetic; unusual excellence in this will be allowed to count in his favor in case of a slight deficiency in other subjects.

Should persons intending to present themselves as candidates acquire a knowledge of algebra, it will be found to be of material assistance in the course of study pursued at the Academy, although not required for admission.

When practicable, should the candidate so prefer, algebraic solutions of problems may be substituted for arithmetical solutions.

GEOGRAPHY.— Candidates will be questioned on the grand divisions of the land and water; the character of coast-lines: the direction and position of mountain-chains and the locality of important peaks; the position and course of rivers, their tributaries, and the bodies of water into which they empty; the position of important seas, bays, gulfs, and arms of the sea; the political divisions of the land, their position, boundaries, and capital cities; the position and direction of great peninsulas, and the situation of important and prominent capes; straits, sounds, channels, and the most important canals; great lakes, and inland seas; position and political connection of important islands and colonial possessions; locality of cities of historical, political, or commercial importance (attention is specially called to the rivers and bodies of water on which cities are situated); the course of a vessel in making a voyage between well-known sea-ports.

GRAMMAR.—Candidates will be examined in the whole of English grammar as treated in the common-school text-books, embracing the following subjects: The divisions of letters and the use of capitals; the parts of speech; the classification of *nouns*, and the distinctions of person, gender, and number; under *number*, the rules for the formation of the plural, nouns irregular and defective in number, the plural of proper names; under *case*, the different uses of the three cases, the rules for inflection, the changes in ending to denote case; the difference between the definite and indefinite *article*, and the use of *a* or *an;* the classification of *adjectives;* the explanation of the different degrees of comparison; the rules for *comparing adjectives;* irregular and defective comparison; numerals and their classification; the double classification of *pronouns*, first, into substantives and adjectives; secondly, into personals, relatives, &c.; peculiarities in the use of personal pronouns, as the difference between *my* and *mine*, between *thou* and *you*, and the various uses of *it;* compound personal pronouns; the double office of relatives, and the different classes of objects to which each of them is applied; compound relative pronouns; interrogative pronouns; adjective pronouns, or pronominal adjectives, and their classification; the classification and conjugation of *verbs;* the relations between transitive and intransitive verbs: the principal parts of regular, irregular, and defective verbs; the uses and inflection of auxiliaries; the essential peculiarities in the use of voice, mood, tense, number, and person; tense-endings and personal endings; impersonal verbs; the classification, formation, and comparison of *adverbs;* conjunctive adverbs; the use of *prepositions*, *interjections*, and *conjunctions*, with the classification of the latter.

The rules for the construction and arrangement of words and sentences, given under syntax.

*Parsing*, according to the following model; giving in the case of each word the explanation of its grammatical relation to the other words in the sentence.

*Noun:* Class, gender, number, person, case.

*Article:* Definite or indefinite; qualified noun.

*Adjective:* Class, compared or not compared; comparison, if admitting it; degree of comparison; qualified noun.

*Personal pronoun:* Person, gender, number, case.

*Relative pronoun:* Person, gender, number, case, antecedent.

*Interrogative pronoun:* Gender, number, case.

*Adjective pronoun* (or pronominal adjective): Class; qualified word.

*Verb:* Class, form, principal parts, tense, mood, voice, person, number, subject.

*Adverb:* Class, derivation and comparison, if derived and compared; qualified word.

*Preposition:* Words between which the relation is shown by the preposition.

*Interjection:* The kind of emotion expressed.

*Conjunction:* Class; words or sentences connected.

READING.—Candidates will be examined in reading aloud English prose.

WRITING AND SPELLING.—Candidates will be required to write a short original letter, and an exercise in dictation, and to spell twenty-four words in common use.

An examination in English branches containing eight or more mistakes in spelling will not be considered satisfactory, and will be sufficient of itself to cause the rejection of the candidate.

### ADMISSION.

XIII. Candidates who pass the physical and mental examinations will receive appointments as Cadet-Midshipmen, and become inmates of the Academy. Each cadet will be required to sign articles by which he binds himself to serve in the United States Navy eight years (including his time of probation at the Naval Academy), unless sooner discharged. The pay of a Cadet-Midshipman is $500 a year, commencing at the date of his admission.

XIV. Cadets, immediately after their admission, will supply themselves with the following articles, viz:

| | | | |
|---|---|---|---|
| One parade-suit | $37 72 | One straw mattress | $1 32 |
| One undress-suit | 20 95 | One hair pillow | 83 |
| One working-suit | 2 41 | One pair blankets | 3 87 |
| One overcoat | 23 30 | Two bedspreads | 2 10 |
| One rubber coat | 4 54 | Six sheets | 3 66 |
| One parade-cap | 4 10 | Four pillow-cases | 1 00 |
| One undress-cap | 1 63 | * One tooth-brush | 23 |
| * Two pairs high shoes | 11 50 | * One hair-brush | 73 |
| * Eight white shirts | 11 04 | * One whisk | 17 |
| * Two night-shirts | 2 10 | * One coarse comb | 10 |
| * Four under-shirts | 2 24 | * One fine comb | 39 |
| Twelve linen collars | 1 68 | One mug | 10 |
| * Eight pairs socks | 2 00 | * One cake soap | 10 |
| * Four pairs drawers | 2 12 | One soap-dish | 10 |
| * Six handkerchiefs | 1 62 | One requisition-book | 30 |
| * Eight towels | 2 00 | One laundry-book | 30 |
| Two pairs drill-gloves | 1 16 | One pass-book | 30 |
| Two pairs Lisle-thread gloves | 50 | One stencil and ink; 1 brush | 41 |
| * One pair suspenders | 38 | * One thread-and-needle case | 53 |
| One neck-tie | 50 | One rug | 1 55 |
| Two clothes-bags | 50 | One wash-basin and pitcher | 1 30 |
| One hair mattress | 6 75 | One looking-glass | 85 |

| | | | |
|---|---|---|---|
| One water-pail | $0 65 | One broom | $0 27 |
| One slop-bucket | 57 | | |
| Total | | | 162 47 |

The articles marked *, not being required to conform to a standard pattern, may be brought by the cadet from home, but all other articles must conform to the regulations, and must, therefore, be supplied by the storekeeper.

Each Cadet-Midshipman must, on admission, deposit with the paymaster the sum of $20, for which he will be credited on the books of that officer, to be expended, by direction of the Superintendent, in the purchase of text-books and other authorized articles besides those enumerated in the preceding article.

All the deposits for clothing and the entrance-deposit of twenty dollars must be made before a candidate can be received into the Academy.

### SUMMARY OF EXPENSES.

| | |
|---|---|
| Deposit for clothing | $162 47 |
| Deposit for books, &c | 20 00 |
| Total deposit required | 182 47 |

The value of clothing brought from home is to be deducted from this amount.

Each Cadet-Midshipman, *one month after admission*, will be credited with the amount of his actual expenses in traveling from his home to the Academy.

XV. A Cadet-Midshipman who voluntarily resigns his appointment within a year of the time of his admission to the Academy will be required to refund the amount paid him for traveling expenses.

R. W. THOMPSON,
*Secretary of the Navy.*

# EXAMINATION OF CANDIDATES FOR ADMISSION AS CADET-MIDSHIPMEN, 1879.

## ARITHMETIC.

SEPTEMBER, 1879.—*Time allowed, three hours.*

1. Divide .0021362486 by .0215. Reduce 27 miles 5 furlongs 184 yds. to metres; 1 metre = 39.37 inches. What per cent. of 11 lbs. 11 oz. 11 dwts. 8 grs. is 3 lbs. 8 oz. 17 dwts. 7 grs.?

2. Add together $47\frac{3}{7}$, $9\frac{11}{12}$, $16\frac{7}{63}$, and $\frac{11}{21}$.

Divide $\dfrac{2\frac{1}{2}+3\frac{1}{4}}{3\frac{1}{4}-2\frac{1}{2}}$ by $\dfrac{2\frac{1}{2}-3\frac{1}{4}}{2\frac{1}{2}\times 3\frac{1}{4}}$.

Simplify $\dfrac{\frac{4}{5}+2\frac{3}{7}+9\frac{11}{56}-3\frac{1}{8}}{\frac{4}{5}+3\frac{1}{3}-2\frac{3}{7}-\frac{11}{56}}$.

3. Find the square root of 34535.867 to three decimal places, and the cube root of .036 to five decimal places. Find what decimal part the square root of $\frac{99}{128}$ is of the square root of $5\frac{1}{2}$.

4. Find the interest on £317 15*s.* 6*d.* for 93 days (30 days to a month) at $5\frac{1}{2}$ per cent. per annum. A bank loans money for 30 days and charges 6 per cent. per annum for 33 days, collecting the interest in advance, and counting 30 days as a month; what rate per cent. per annum (365 days) does the bank actually receive? What ought to be paid for $100 shares in a stock which pays 6 per cent. annual dividends in order that 8 per cent. may be made upon the investment?

5. A sum of £250 17*s.* 6*d.* is transmitted through Paris to New York—£1 = 24.79 francs; 9.2 francs = $1.75; find the value of the sum in United States money. The value of a pound of gold is $15\frac{1}{2}$ times that of a pound of silver, and the weights of equal *bulks* of gold and silver are in the ratio of 17.2 to 10.5; find the value of a piece of silver which is equal in bulk to a $20 gold piece.

## ENGLISH BRANCHES.

JUNE 13, 1879.—*Time allowed, three hours.*

### GRAMMAR.

### I.

1. Give the principal parts of *behold, awake,* (*to*) *busy* (*himself*), *grow, burst.*
2. Inflect (or decline) *view, hue, pigmy, dwarf.*
3. What is a participle? an intransitive verb? the active voice? the potential mood?
4. Analyze: Instead, however, of answering the expectations raised with regard to the work on which it was supposed to rest, the foundation proved to be a wretched piece of brickwork.

### II.

Parse the words in italics: We were roused as *soon* as the sun dawned by Antony, our *Greek servant,* with the news *that* the Pyramids were in *view.* *Never* will the *impression made* by their appearance be obliterated. By *reflecting* the sun's *rays, they* appeared as white as *snow,* and of *such magnitude that nothing* we had previously seen *could have prepared* us for them.

### SPELLING.

Audible.
Perfumery.
Fundamental.
Disparagement.
Patrician.
Traitor.
Extemporaneous.
Pertinacious.
Apostle.
Reality.
Prejudice.
Sustenance.
Unforeseen.
Irrepressible.
Epithet.
Discreet.
Quarantine.
Fief.
Dynasty.
Massacre.
Elicited.
Parasite.
Novice.
Versatile.

### GEOGRAPHY.

I. Describe the following rivers, telling where they rise, in what direction they flow, and into what water they empty; and state whether they form the boundary between different States or Territories, naming the States divided: 1, Orange River; 2, Red River; 3, Save River; 4, Vistula River.

II. Fix the position of the following towns, telling on what water they are situated: 1, Glasgow; 2, St. Paul de Loando; 3, Saragossa; 4, Rouen; 5, Omaha.

III. From what land, and into what water, do the following capes project?—Trafalgar, Gall inas, Bathurst, North Foreland.

IV. State what bodies of water are connected and what bodies of land separated by the following: 1, Niagara River; 2, Strait of Magellan; 3, Menai Strait; 4, Palk Strait.

V. Fix the position of the following mountains, and tell which of them are volcanoes: 1, Mt. Blanc; 2, Cotopaxi; 3, Hecla; 4, Everest.

VI. Name in order the States on the sea-coast of Europe, giving the capital of each.

## RE-EXAMINATION.

### ARITHMETIC.

SEPTEMBER, 1879.—*Time allowed, five hours.*

1. Divide .0073639619 by .000265847. Divide 99 miles 29 rods 2 feet 6 inches by 41, giving the result as so many miles, furlongs, &c. What decimal part of a year of $365\frac{1}{4}$ days is 27 days 16 hours 29 minutes 4 seconds? (four decimal places).

2. Add together $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$, and $\frac{6}{7}$, and subtract the result from $100\frac{1}{100}$.

Simplify $\dfrac{\frac{1}{2}+\frac{1}{3}+\frac{1}{4}}{\dfrac{1}{2\frac{1}{2}}+\dfrac{1}{3\frac{1}{2}}+\dfrac{1}{4\frac{1}{2}}}$.

To the product of $6\frac{1}{2}$, $7\frac{2}{3}$, and $8\frac{3}{4}$ add $\dfrac{3\frac{5}{8}}{4\frac{4}{5}}$, and divide the sum by $\frac{46}{5}$ of $\frac{65}{6}$ of $\frac{99}{8}$.

3. Find the square root of 893830609. Find the square root of .025 to two decimal places. Find the cube root of $26-15\sqrt{3}$ to four decimal places.

4. A person buys bonds which pay 7.3 per cent. annual interest (par value $100) at $108; what rate of interest will he receive on his investment? At what rate per cent. is the deduction made when 19*s.* 10½*d.* is taken from an account of £39 15*s.* in consideration of immediate payment? Money being worth 5½ per cent. per annum, what is the present value of a note for $3,750 due in three months?

5. When cloth is sold at $1.37½ per yard, what is the corresponding price in francs per metre? 1 metre = 39.37 inches; $1 = 5.25 francs. What is the weight of a cubic metre of water if 1 cubic foot weighs 1,000 ounces? (Give the weight in pounds.)

## ENGLISH BRANCHES.

JUNE 16, 1879.—*Time allowed, three hours.*

### GRAMMAR.

#### I.

1. Give the principal parts of *know, spend, wear, sit, set.*
2. Inflect (or decline) *verge, folly, belief, sheaf, child.*
3. Compare *gay, happy.* What is a pronominal adjective? Name the three cases, and explain the different uses of each.
4. Analyze: The world is not solicitous to know whence proceeded the faults of an author, yet it may gratify curiosity to say that this book was written without the patronage of the great.

#### II.

Parse the words in italics: He *that* can *only* be *useful* on great occasions *may die* without *exerting* his *abilities,* and *stand* a helpless *spectator* of a thousand vexations which *fret away happiness,* and *which nothing* is required to *remove but* a little dexterity of conduct.

### SPELLING.

Lateral.
Musician.
Competition.
Necessary.
Machinery.
Undefiled.
Volley.
Delirium.
Leakage.
Glycerine.
Abutment.
Counterbalance.
Sanitary.
Development.
Benevolence.
Paralysis.
Intervene.
Equipage.
Engineer.
Efficiency.
Advantageous.
Feasible.
Wrought-iron.
Indispensable.

### GEOGRAPHY.

I. Where are the following places, and to what State do they belong?—1, Melbourne; 2, Pondicherry; 3, Aden; 4, Jamaica; 5, Corsica.

II. Name three principal rivers of France, telling where they rise, in what direction they flow, and into what water they empty. Name a city situated upon each of these rivers.

III. Name *three* seaports on the west coast, *two* on the north coast, and *three* on the east coast of South America, telling in what State each of them is situated.

IV. Name the Territories of the United States. Bound Nevada.

V. Fix the position and direction of the following: 1, Carpathian Mountains; 2, Hartz Mountains; 3, Blue Ridge; 4, Altai Mountains.

VI. How many States are there in the Union? Fix the position of the following, and tell on what water they are situated: 1, Trieste; 2, Kiel; 3, Cairo; 4, Madras; 5, Harrisburg.

# REGULATIONS

FOR THE

# APPOINTMENT OF CADET-ENGINEERS IN THE UNITED STATES NAVY.

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I. In pursuance of law, applications will be received by the Navy Department for the appointment of Cadet-Engineers.

II. The application is to be addressed to the Secretary of the Navy, and can be made by the candidate or by any person for him, and his name will be placed on the register. The registry of a name, however, gives no assurance of an appointment, and no preference will be given in the selection to priority of application.

III. The number of appointments which can be made is limited by law to twenty-five each year. The candidate must not be less than sixteen nor more than twenty years of age; he will be required to certify *on honor* to his precise age, to the Academic Board, previous to his examination, and no one will be examined who is over or under the prescribed age. His application must be accompanied by satisfactory evidence of good moral character and health, with information regarding date of birth and educational advantages hitherto enjoyed. Candidates who receive permission will present themselves to the Superintendent of the Naval Academy on the 15th of September for examination as to their qualifications for admission.

IV. The course of study will comprise four years at the Naval Academy, and two additional years at sea. All Cadets who finally graduate will be commissioned Assistant Engineers in the Navy as vacancies occur. The pay of a Cadet-Engineer while at the Naval Academy is $500 per annum.

V. The academic examination previous to appointment will be competitive, and will be on the following subjects, namely: Arithmetic; algebra, through equations of the first degree; plane geometry; rudimentary natural philosophy; reading; writing; spelling; English grammar; English composition; geography; free-hand drawing; and an elementary knowledge of the principles governing the action of the steam-engine. Candidates who possess the greatest skill and experience in the practical knowledge of machinery, *other qualifications being equal*, shall have precedence for admission.

VI. The examination before the Medical Board is the same as that of candidates for appointment as Cadet-Midshipmen. See p. 49.

The following deposits must be made before a candidate can be received into the Academy:

| | |
|---|---|
| For clothing (see p. 52) | $162 47 |
| For books and drawing instruments | 50 00 |
| Total | 212 47 |

VII. Persons who contemplate presenting themselves as candidates for admission as Cadet-Engineers are cautioned that the number of applicants is large, and the competition exceedingly close. It is, therefore, useless for candidates to present themselves unless well prepared on the subjects of the examination, and unless their physical qualifications are within the prescribed standard.

# COMPETITIVE EXAMINATION OF CANDIDATES FOR APPOINTMENT AS CADET-ENGINEERS, SEPTEMBER, 1879.

*Number of competitors*, 177.

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## ARITHMETIC.

*Time allowed, three hours.*

1. Add $\frac{11}{504}$ to the difference of .014 and $\frac{3}{250}$ and reduce the result to a decimal (six places). What per cent. of £31 17*s*. 4*d*. is £5 19*s*. 6*d*.? Reduce $.20\dot{8}\dot{3}$ (the 83 is repeated indefinitely) to a common fraction.

2. What will it cost to make a road 104 rods long and 60 feet wide, the land costing $154 an acre, grading at the rate of $200 a mile, and fencing one side at 50 cents a yard?

3. Find the square root of 324.00007625, and the value of $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}-\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$, each to six places of decimals.

4. The French gramme is the weight of a cubic centimetre of water; a kilogramme is 1,000 grammes. Find the weight in kilogrammes of an anchor weighing 6,500 pounds, given that a cubic foot of water weighs 1,000 ounces, and the centimetre is .3937 of an inch.

5. In loaning money, banks deduct the interest, including the three days of grace, in advance. For what sum shall a person who wishes to use $1,500 give his note for 60 days, interest 8 per cent. per annum? A person having a note for $2,000 due at a bank, pays in $200, and requests that a new note may be made at 90 days, the sum paid serving to pay the interest on the new note as well as to reduce his debt; for what sum shall the note be issued, the rate of interest being 8 per cent. per annum?

## ALGEBRA.

*Time allowed, three hours.*

1. Reduce to their simplest forms the expressions:

$$\frac{x^2+xy+y^2}{x^2-xy+y^2}\times\frac{x^3+y^3}{x^3-y^3}\times\frac{(x-y)^2}{(x+y)^2},\quad \frac{1}{(x-1)(x+1)}-\frac{2}{(x+1)(x+3)}+\frac{1}{(x+3)(x-1)},$$

and

$$\frac{x}{(x+y)(x+2y)}+\frac{2y}{(x+y)(x+3y))}+\frac{x}{(x+2y)(x+3y)}-\frac{2}{x+3y}.$$

2. Separate each of the following quantities into its simplest factors:

$$6x^2+5x-6,\ 8x^3-27y^3,\ 9x^4-82x^2y^2+9y^4,\ (x^2+4x)^2-2(x^2+4x)-15,$$

and

$$2x^2-21xy-11y^2-x+34y-3.$$

3. Solve the equations:

$$\frac{2x-1}{3}-\frac{3}{4}(x-3)+\frac{4}{5}(3x-8)=25,$$

$$a(x-a)+b(x-b)+c(x-c)=2ab+2ac+2bc,$$

and

$$a(x+y)+b(x-y)=c(x+y)+d(x-y)=1.$$

4. Find the value of $\frac{\sqrt{a+x}+\sqrt{a-x}}{\sqrt{a+x}-\sqrt{a-x}}$ when $x=\frac{2ab}{b^2+1}$.

Given $x-y=7z$, and $x-z=4y$, find the value of $\frac{y-z}{x}$.

5. Solve the equation $\frac{x-1}{x-2}-\frac{x-2}{x-3}=\frac{x-5}{x-6}-\frac{x-6}{x-7}$.

A railway train runs a certain distance at a certain rate; had the rate been increased y $a$ miles per hour, the distance would have been performed in $\frac{b}{c}$ of the time; but ad the rate been diminished by $a$ miles per hour, the time would have been increased y $d$ hours: find the distance and the rate per hour.

## GEOMETRY.

*Time allowed, two hours and a half.*

1. Prove that when two parallels are cut by a third straight line, the alternate inerior angles are equal. Prove that the sum of the distances of any point from the hree angles of a triangle is greater than the half sum of the sides. Show how to ivide a given line into three equal parts.

2. Prove that if a series of parallels cutting any two straight lines intercept equal istances on one of the lines they also intercept equal distances on the other. Show ow to find a mean proportional between two lines, and apply the method to construct line $\sqrt{3}$ units in length.

3. Prove that in any triangle the square of a side opposite an acute angle is equal the sum of the squares of the other two sides diminished by twice the product of ne of these sides and the projection of the other upon that side. Show how to draw tangent to a given circle through a given point not on the circumference.

4. Prove that in any triangle the product of two sides is equal to the product of the iameter of the circumscribed circle by the perpendicular let fall upon the third side rom the vertex of the opposite angle. Show how to describe upon a line of given ength a segment which shall contain a given angle.

5. Prove that the straight lines which bisect the vertical angles of all triangles on he same base, and on the same side of it, and having equal vertical angles, all pass hrough the same point. Show how to construct a triangle, given the base, the oppoite angle, and the radius of the inscribed circle.

## NATURAL PHILOSOPHY.

*Time allowed, three hours.*

1. A man rowing across a stream, which flows at the rate of 4 miles an hour, pulls irectly toward the opposite bank at the rate of 3 miles an hour; find his actual elocity in miles per hour, and his time in crossing if the stream is one-half a mile wide.

2. If a body falling from rest describes 16 feet the first second, how far will it fall uring the fourth second? The acceleration due to gravity being 32 feet per second, nd the time in which a body falling from rest will acquire a velocity of 352 feet per econd.

3. The height of a water-barometer being 34 feet, and that of a mercurial barometer 0 inches; find the specific gravity of mercury. If the height of a barometer rises from 0 inches to 30.25 inches, what is the increase in pressure in ounces per square foot? a cubic foot of water weighing 1,000 ounces).

4. A body weighs in air 1000 grains, in water 300 grains, and in another liquid 440 rains; what is the specific gravity of the latter liquid? A body whose specific gravty is 3.5 weighs 4 pounds in water, what is its actual weight? What is the pressure pounds per square inch on the cork of an empty bottle sunk 120 fathoms in water?

5. When an elevator is descending with an accelerated motion, how does the weight of a man compare with the pressure he exerts in standing upon it? How does his weight compare with the pressure when the motion is uniform? (Give reasons for your answers.) How will a fall in the barometer affect the action of a siphon?

6. Ten men heave with a force of 75 pounds each, at as many capstan bars, 8 feet from the axis of the capstan; the cylinder on which the hawser winds is 2 feet in diameter and the hawser 4 inches in diameter; find the tension of the hawser.

7. What weight of copper does a coin, contain which is a mixture of copper (specific gravity 8.5) with gold (specific gravity 17.5), and which weighs 123 grains in air and 112½ grains in water? Find the specific gravity of a mixture of 9 parts, by weight, of pure gold (specific gravity 19.4) with 1 part of copper.

8. A rope reeves through a single block, and both ends are made fast to a weight below the block; a man fastens a stick to one part of the rope, sits upon it and pulls on the rope below him; supposing that he weighs 150 pounds and can lift 150 pounds, what weight can he raise?

## ENGLISH BRANCHES.

*Time allowed, three hours.*

### ENGLISH GRAMMAR.

I. 1. Decline *box, enemy, journey, wreath;* 2. Give the past participle of *thrust, burst, die, creep.*

II. Parse the words in italics:

*Many* a *night* from *yonder ivied* casement *ere* I went to *rest,*
Did I *look* on great *Orion sloping* slowly to the *west.*

### SPELLING.

Ameliorate.
Certify.
Collision.
Allegiance.
Enamored.
Episode.
Smoulder.
Court-martial.
Guarantee.
Pamphlet.
Brilliant.
Miniature.
Preceptor.
Adherent.
Agreeable.
Suicide.
Literature.
Flippancy.
Semblance
Sovereign.
Infidel.
Rhapsody.
Duchess.
Fascinate.

### GEOGRAPHY.

1. Give the source, direction, and body of water at the mouth of, 1, Colorado River; 2, Loire River; 3, Indus River; 4, Don River.

2. From what country and into what water do the following capes project: 1, Lopatka; 2, Bon; 3, San Lucas; 4, Wrath.

3. Fix the position of the following cities, and tell on or near what water each is situated: 1, Presburg; 2, Aberdeen; 3, Kingston; 4, Callao.

4. Fix the position and direction of the following mountains: 1, Carpathian; 2, Blue Ridge; 3, Caucasus.

# COURSE OF INSTRUCTION.

## DEPARTMENT OF SEAMANSHIP.

Seamanship.*—Descriptions of all kinds of rope, and its practical manipulation for l purposes on shipboard; measuring for and fitting standing and running rigging; asting, sparring, and rigging ship; getting on board and stowing a vessel's outfit; ganizing a ship's company; the fittings of boats; the management of boats under l circumstances; evolutions of vessels at sea and in harbor; repair of spars and rig-ng in cases of accident; duties of officers at sea and in port; rules of the road; wind d weather.

*Text-book.*—Luce's Seamanship, with lectures and illustrations from models.

Ship-Building.

*Text-books.*—Thearle's Naval Architecture and Wilson's Ship-Building, with lectures ustrated by models and drawings.

Naval Tactics.*—Organization, formations, and manœuvring of a fleet, under eam or sail.

*Text-books.*—Manual of Naval Tactics (Ward); Steam Fleet Tactics (Parker); United ates Naval Signal-Book; Manual of Signals (Myer).

Practical exercises, consisting of—

Seamanship-drills.*—Exercises on shipboard with sails and spars.

Naval tactics.*—Exercises in boats under oars and under sails.

Signals.—Exercises in the use of signals according to Myer's Army Signal Code.

Practical Seamanship.*—Exercises on board the United States sloop-of-war Dale turday mornings.

The instruction in boxing, gymnastics, swimming, and dancing is in charge of this partment.

## DEPARTMENT OF ORDNANCE AND GUNNERY.

Practice and theory of gunnery.*—*Practical naval gunnery*, as laid down in e Ordnance and Gunnery Instructions for the United States Navy.

Preparation of gun-iron from crude ore, including the description and use of furnaces; nufacture of wrought iron, steel, and bronze; fabrication of guns of all descriptions; nufacture of gunpowder and fuses, and of all kinds of projectiles and fire-works.

*Theory of gunnery.*—Motion of projectiles *in vacuo* and in the atmosphere; initial, maining, and final velocities, and the methods of determining their values; the ects of variations of charge, windage, and weight of projectiles; deviation of pro-tiles; the several systems of pointing; tangent-sights and determination of their lues; penetration and shock of projectiles; and recoil of guns.

*Text-books.*—Cooke's Naval Ordnance and Gunnery; Ordnance Instructions, United ates Navy; Gunnery Instructions, United States Navy.

Infantry tactics.*—Organization and formation of squad, company, and battal-n; school of the soldier; company and battalion drill, including instructions for skir-shers and the bayonet exercise.

*Text-books.*—United States Infantry Tactics; Wingate's Rifle Practice.

Practical exercises, consisting of—

Infantry-drill.

Field-artillery and boat-howitzer exercise.

Great guns.—Exercises and target-practice on board the United States ship Santee.

Mortar-practice.

Fencing.—Exercises with small-swords and broadswords.

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* Cadet-Midshipmen only.

## DEPARTMENT OF MATHEMATICS.

Algebra.—Fundamental operations; reduction and conversion of fractional and surd quantities; involution and evolution; reduction and solution of equations of the first and second degrees; the summation of series; the nature, construction, and use of logarithms; the theory of equations.

Geometry.—Plane and solid geometry; the mensuration of surfaces and volumes; the application of algebra to geometry.

Trigonometry.—Analytical investigation of trigonometric formulas, and their application to all the cases of plane and spherical trigonometry; the construction and use of trigonometric tables; the solution of trigonometric equations; trigonometric series.

Analytical geometry.—Equations of the right line, plane, and conic sections; discussion of the general equation of the second degree, involving two or three variables; determination of loci; principal problems relating to the cylinder, cone, sphere, and spheroids.

Descriptive geometry.—The graphic illustration and solution of problems in solid geometry, and the application of the method, particularly to the projections of the sphere and to the construction of maps.

*Text-books.*—Ray's Higher Algebra;* Todhunter's Algebra for Beginners;† Chauvenet's Geometry;* Wentworth's Geometry;† Chauvenet's Trigonometry; Church's Descriptive Geometry; Todhunter's Conic Sections; Bowditch's Useful Tables.

## ELECTIVE COURSES.

In addition to the above, Cadets of the third and fourth classes who display marked ability in methematics are permitted to take an advanced course. The following are the elective courses for 1879–'80:

*Fourth class.*—Algebra, the theory of equations, and curve-tracing.

*Third class.*—The elements of the differential and integral calculus, with application to trigonometry and to geometry of two dimensions.

*Text-books.*—Todhunter's Algebra for Colleges and Schools; Todhunter's Theory o Equations; Rice and Johnson's Elements of the Differential Calculus.

## DEPARTMENT OF STEAM-ENGINEERING.

Marine engines.—General theory of the steam-engine; classification and details o marine steam-engines, and of instruments and apparatus used in connection with them the computation of the power and its cost; instruction in the duties of the engine-roon watch and of the engineer division, by means of practical exercises on board the Unite States steamers Nantucket and Mayflower under weigh.

Fabrication of machinery.*—The qualities and strength of materials, and th processes of manufacture, accompanied by practical exercises with the worksho methods and appliances for the conversion of the various materials into finishe machinery.

Designing of machinery.*—Pure mechanism, and the designing of boilers an engines, including valve-gears.

Mechanical drawing.*—The nomenclature of design; general and conventiona practices of the art; the execution of plans, elevations, and sections; isometrica projections; shades, shadows, and linear perspective.

Practical exercises.—The management of marine steam apparatus; [the use c tools and machines; hand-work of the machine-shop, pattern-shop, smithery, boiler shop, and foundry.]*

*Text-books.*—Weisbach's Mechanics of Engineering, Vol. II; Northcott's Steam-Er gine; Warren's Elements of Mechanical Drawing; Willis's Principles of Mechanism Rankine's Steam-Engine and other Prime Movers; Zeuner's Valve-Motion, and Shel ley's Workshop Appliances; King's Lessons and Notes on the Steam-Engine.

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*Cadet-Engineers only. †Cadet-Midshipmen only.

## DEPARTMENT OF ASTRONOMY, NAVIGATION, AND SURVEYING.

ASTRONOMY.—Descriptive and practical astronomy, including the use of instruments, especially those used for determining terrestrial latitudes and longitudes.

*Text-books.*—C. J. White's Astronomy; Theory of the Portable Transit and the enith Telescope.

NAVIGATION.*—Theory and practice of navigation, the latter including instruction n the duties of the navigator, the use of navigating instruments, and their construcion, with the solution of problems and the use of tables.

*Text-books.*—Coffin's Navigation; Howell's Mathematical Theory of the Deviations f the Compass; Bowditch's Navigator; Howell's Marine Surveying.

SURVEYING.*—The form of the earth, with special reference to the construction of harts; explanation of geodetical surveys; the solution of problems in nautical surveying, and practical work in surveying and constructing charts.

*Text-book.*—Howell's Marine Surveying.

## DEPARTMENT OF PHYSICS AND CHEMISTRY.

ACOUSTICS.—Theory of waves; the production and propagation of sound; the numerical evaluation of sound; modes of vibration; communication of vibrations; nalysis of vibrations.

OPTICS.—The propagation, reflection, and refraction of light; lenses, vision, and optical instruments; spectrum analysis; color; the undulatory theory of light; polarization and double refraction.

ELECTRICITY AND MAGNETISM.—Statical electricity; dynamical electricity; magnetism; electro-magnetism; electrical measurements; thermo-electricity; applications f electricity.

CHEMISTRY.—General chemistry.

EXPERIMENTAL LECTURES IN PHYSICS AND CHEMISTRY.

HEAT.—Theories of heat; sources of heat; conduction, radiation, and convection; pecific heat; effects of heat; instruments used for the measurement of heat; thermodynamics.

PHYSICAL MEASUREMENTS.†—In this course the Cadets are permitted to elect between work in the physical laboratory and work in the chemical laboratory.

The work in the physical laboratory during the year 1878–'79 consisted in determinations of specific and latent heat; the comparison of several methods of determining he hygrometric state of the atmosphere; the determination of specific gravities; the determination of heat conductivity; the determination of the electro-motive force nd resistances of batteries; an original investigation of the changes of electrical resistance in some substances due to changes of pressure; the resistance of metallic ilms; an original investigation of the electrical resistance of boiler-scale; the determination of the dip, declination, and intensity of the earth's magnetism; the use f the spectroscope and of the spectrometer; the determination of the indices of refraction; experiments in tempering steel, and experiments on the torsional and tensile strength of wires.

The work in the chemical laboratory during the year 1878–'79 embraced blowpipe nalysis; crystallography; mineralogy; quantitative analysis.

The course in mineralogy comprised the study in the mineral cabinet of the most commonly recurring minerals, the useful ores, and the objectionable minerals which are requently associated with them.

The course in quantitative analysis consisted of the gravimetric determination of—

Iron in ammonio-ferrous sulphate.

Copper and tin in gun-metal.

Copper, antimony, and zinc in "white brass."

Tin and lead in solder.

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*Cadet-Midshipmen only. †Cadet-Engineers only.

Lead, carbon dioxide, and insoluble residue in a white lead ground in oil.

Valuation of a coal.

The preparation and standardizing of a solution of potassia permanganate by means of iron wire, ammonio-ferrous sulphate, oxalic acid, and ammonic oxalate.

The estimation of iron in an iron salt, and in hematite and magnetite ores by means of the permanganate solution.

Preparation and standardizing of a solution of potassia dichromate.

Estimation of iron in an iron salt by Penny's method.

*Text-books.*—Stewart's Elementary Physics; Eliot and Storer's Chemical Analysis; Jenkins's Magnetism and Electricity; Stewart's Elementary Treatise on Heat; Miller's Inorganic Chemistry; Kohlrausch's Physical Measurements; Nason and Chandler's Blowpipe Analysis; Dana's Manual of Mineralogy; Thorpe's Quantitative Chemical Analysis.

Cadet-Engineers of the first class have additional practical exercises in chemical analysis every Saturday morning, while the Cadet-Midshipmen exercise in seamanship.

## DEPARTMENT OF MECHANICS AND APPLIED MATHEMATICS.

THE DIFFERENTIAL AND INTEGRAL CALCULUS.—The principles of the differential calculus, including Taylor's theorem, applications to problems of maxima and minima, and the tracing of curves; the methods of integration and the application of the integral calculus to areas, surfaces, and volumes, and to the finding of centres of gravity and moments of inertia, and to simple cases of differential equations.

MECHANICS.—*Statics*, including the theory of friction, adhesion, and stiffness of cordage. *Dynamics*, including the motion of projectiles in a non-resisting medium and in air; motions of translation and of rotation of bodies about an axis; falling bodies; central forces; the simple and the compound pendulum; the laws of planetary motion; work and conservation of energy.

HYDROSTATICS.—Mechanical properties of fluids; the laws of equilibrium and pressure; the flotation of bodies; the stability and oscillations of floating bodies; specific gravity; the motion of liquids. *Aëriform fluids.*—Laws of pressure; weight and pressure of the atmosphere; density and temperature; the barometer, the siphon, and the pump.

THE STRENGTH AND RESISTANCE OF MATERIALS.*—Simple and compound stresses; the relations between strain and stress; the strength and stiffness of beams; beams of uniform resistance.

THE METHOD OF LEAST SQUARES.*—The theory of the method of least squares and the application of the method to results derived from experiments.

THEORETICAL NAVAL ARCHITECTURE.*

*Text-books.*—Rice and Johnson's Differential Calculus; Williamson's Integral Calculus; Todhunter's Mechanics for Beginners; Smith's Hydrostatics; Rankine's Applied Mechanics; Merriman's Method of Least Squares; Wilson's Theoretical and Practical Ship-Building.

### ELECTIVE COURSES.

Cadets who have completed the elective course in mathematics are permitted to take an advanced course in integral calculus and in analytical mechanics.

The course in Theoretical Naval Architecture is elective for Cadet-Midshipmen. There is also an elective course in Theoretical Naval Architecture for Cadet-Engineers.

*Text-books.*—Williamson's Integral Calculus, and Tait and Steele's Dynamics of a Particle; Lectures on the Mathematical Theory of Naval Architecture.

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* Cadet-Engineers only.

## DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

LAW.—Constitution of the United States.

International law:—rights and duties of nations in peace and war; rights of interference, of jurisdiction over the sea, of commerce, of passage over land and navigable rivers; duties of ministers, consuls, and naval commanders; kinds of property liable to capture; domicile; privateering; prizes; *jus postliminii;* rights and duties of neutrals; contraband; blockade; right of search; ship's papers; offenses against the law of nations.

Outlines of maritime law.

Lectures.

*Text-books.*—Woolsey's International Law; Andrews's Manual of the Constitution.

HISTORY.—Outlines of history, especially the history of Greece and Rome, and of the states of Western Europe down to 1875; historical geography; progress of colonial development in America; history of the United States; naval history; lectures.

*Text-books.*—Freeman's General Sketch of History, with Labberton's Historical Atlas; Eliot's History of the United States, with modern atlases.

RHETORIC AND COMPOSITION.—Essential properties of style; classification of sentences; rules for the construction of sentences; figures of rhetoric; exercise in the composition of themes and official reports.

*Text-book.*—Bain's Rhetoric.

ENGLISH.—Historical development of the English language; changes wrought by foreign influence on the grammar, vocabulary, and pronunciation. Etymology. Syntax; analysis of sentences.—Readings from standard authors. Classification of words; definition of words by usage and by derivation; synonyms; laws of change in the meaning of words .—Faults in diction, and their remedies; selection and arrangement; elementary principles of reasoning.

*Text-books.*—Tancock's English Grammar and Reading Book; Seeley and Abbott's English Lessons; Hart's Manual of Punctuation.

## DEPARTMENT OF MODERN LANGUAGES.

FRENCH AND SPANISH LANGUAGES.—Grammar; exercises in reading, writing, and conversation.

The course in Spanish is elective.

*Text-books.*—Keetel's French Grammar; La Fontaine's Fables; Prud'homme's French Nautical Phrases; Erckmann-Chatrian's *Le Conscrit* and *Waterloo;* Gasc's Dictionary; Roget's Spanish Manual; Tolon's Reader; Barretti's Dictionary.

## DEPARTMENT OF DRAWING.

Right-line drawing; free-hand drawing and perspective; topographical and chart drawing.

The foregoing studies are distributed over four years, and the Cadets are arranged in four classes, each class pursuing the course for the corresponding year.

## PROGRAMME OF RECITATIONS.

The time devoted to daily recitations is divided into three periods, indicated thus :—(1), (2), (3). (1) denotes first period, from 8.20 a. m. to 10.20 a. m.; (2) denotes second period, from 10.35 a. m. to 12.35 p. m.; and (3) denotes third period, from 2 p. m. to 4 p. m.

Practical exercises begin on Saturdays at 8 a. m. from October 1 to December 15, and from March 10 to June 1; and at 10.45 a. m. from December 15 to March 10. On other days, except Sundays, practical exercises begin at 4 p. m.

### FIRST TERM.

*From October* 1, 1879, *to February* 1, 1880.

### CADET-MIDSHIPMEN.

| Departments. | Periods. | Subjects. |
|---|---|---|
| | FOURTH CLASS—FIRST YEAR. | |
| Seamanship | M. (3) | Seamanship. |
| Mathematics | M. T. W. Th. F. (2) S. (1) | Algebra and Geometry.<br>Elective course once a week. |
| English Studies, History, and Law | M. T. W. Th. F. (1) | English and History. |
| Modern Languages | 1st division, T. Th. (3)<br>2d division, W. F. (3) | Keetel's French Grammar, and elective course in Spanish. |
| Drawing | 1st division, W. F. (3)<br>2d division, T. Th. (3) | Free-hand drawing. |
| | THIRD CLASS—SECOND YEAR. | |
| Seamanship | W. (3) | Seamanship. |
| Mathematics | M. T. W. Th. F. (1)<br>F. (3) | Trigonometry.<br>Elective course once a week.<br>Descriptive Geometry. |
| English Studies, History, and Law | M. T. Th. (3) | English and History. |
| Modern Languages | M. W. F. (2) | French, and Elective course in Spanish. |
| Drawing | T. Th. (2) S (1) | Topography. |
| | SECOND CLASS—THIRD YEAR. | |
| Seamanship | Th. (3) | Luce's Seamanship. |
| Ordnance and Gunnery | F. (3) | Infantry Tactics and Ordnance Instructions. |
| Astronomy, Navigation, and Surveying | M. (2) T. (3) | Astronomy. |
| Mechanics and Applied Mathematics | M. T. W. Th. F. (1) | Calculus.<br>Elective course twice a week. |
| English Studies, History, and Law | One period a month. W. (2) | English studies. |
| Modern Languages | M. (3) Th. (2) | French, and Elective course in Spanish. |
| Physics and Chemistry | T. F. (2) W. (3) S. (1) | Chemistry and Heat. |
| | FIRST CLASS—FOURTH YEAR. | |
| Seamanship | T. (3) F. (1)<br>M. W. (2) | Ship-building.<br>Luce's Seamanship. |
| Ordnance and Gunnery | Th. S. (1) F. (2) | Ordnance and Armor. |
| Steam-engineering | W. Th. F. (3) | Marine Engines. |
| Astronomy, Navigation, and Surveying | M. T. W. (1) | Navigation. |
| Physics and Chemistry | M. (3) Th. (2) | Electricity. |
| Modern Languages | T. (2) | French, and Elective course in Spanish. |

### CADET-ENGINEERS.

| Departments. | Periods. | Subjects. |
|---|---|---|
| | FOURTH CLASS—FIRST YEAR. | |
| athematics | M. T. W. Th. F. (2) S. (1) | Algebra and Geometry.<br>Elective course once a week. |
| team-engineering | M. T. Th. (3) | Mechanical Drawing, and Fabrication of Machinery. |
| nglish Studies, History, and Law | M. T. W. Th. F. (1) | English and History. |
| odern Languages | W. F. (3) | Keetel's French Grammar, and elective course in Spanish. |
| | THIRD CLASS—SECOND YEAR. | |
| athematics | M. T. W. Th. F. (1) | Trigonometry and Descriptive Geometry.<br>Elective course once a week. |
| | F. (3) | Descriptive Geometry. |
| team-engineering | T. Th. (2) W. (3) S. (1) | Mechanical Drawing, and Fabrication of Machinery. |
| nglish Studies, History, and Law | M. T. Th. (3) | English and History. |
| odern Languages | M. W. F. (2) | French, and Elective course in Spanish. |
| | SECOND CLASS—THIRD YEAR. | |
| team-engineering | M. (2) T. Th. F. (3) | Mechanical Drawing, Marine Engines, and Fabrication of Machinery. |
| echanics and Applied Mathematics | M. T. W. Th. F. (1) | Calculus.<br>Elective course twice a week. |
| nglish Studies, History, and Law | One period a month. W. (2) | English studies. |
| odern Languages | M. (3) Th. (2) | French and elective course in Spanish. |
| hysics and Chemistry | T, F. (2) W. (3) S. (1) | Chemistry and Heat. |
| | FIRST CLASS—FOURTH YEAR. | |
| eamanship | T. (3) F. (1) | Ship-building. |
| team-engineering | M. T. W. Th. S. (1) W. Th. F. (3) | Marine Engines, Fabrication and Designing of Machinery, and Mechanical Drawing. |
| hysics and Chemistry | M. (3) Th. (2) | Electricity. |
| echanics and Applied Mathematics | M. W. F. (2) | Strength of Materials. |
| odern Languages | T. (2) | French, and Elective course in Spanish. |

### SECOND TERM.

*From February* 1, 1880, *to June* 1, 1880.

### CADET-MIDSHIPMEN.

| Departments. | Periods. | Subjects. |
|---|---|---|
| | FOURTH CLASS—FIRST YEAR. | |
| eamanship | M. (3) | Seamanship. |
| athematics | M. T. W. Th. F. (2) S. (1) | Algebra and Geometry.<br>Elective course once a week. |
| nglish Studies, History, and Law | M. T. W. Th. F. (1) | English and History. |
| odern Languages | 1st division, T. Th. (3)<br>2d division, W. F. (3) | French, and elective course in Spanish. |
| rawing | 1st division, W. F. (3)<br>2d division, T. Th. (3) | Topography. |
| | THIRD CLASS—SECOND YEAR. | |
| eamanship | Th. (3) | Seamanship. |
| athematics | M. T. W. Th. F. (1) | Analytical Geometry.<br>Elective course once a week. |
| | F. (3) | Descriptive Geometry. |
| hysics and Chemistry | T. (3) Th. (2) S (1) | Elementary Physics. |
| nglish Studies, History, and Law | M. W. (3) T. (2) | English and History. |
| odern Languages | M. W. F. (2) | French, and Elective course in Spanish. |

### CADET-MIDSHIPMEN—Continued.

| Departments. | Periods. | Subjects. |
|---|---|---|
| | SECOND CLASS—THIRD YEAR. | |
| Seamanship | W. F. (3)<br>Th. (2) | Luce's Seamanship.<br>Naval Tactics. |
| Ordnance and Gunnery | T. Th. (3) | Infantry Tactics and Ordnance Instructions. |
| Astronomy, Navigation, and Surveying | F. (2) | Astronomy. |
| Mechanics and Applied Mathematics | M. T. W. Th. F. (1) | Mechanics.<br>Elective course twice a week. |
| English Studies, History, and Law. | One period a month | English studies. |
| Modern Languages | M. (3) T. (2) S. (1) | French, and Elective course in Spanish. |
| Physics and Chemistry | M. W. (2) | Heat. |
| | FIRST CLASS—FOURTH YEAR. | |
| Seamanship | M. W. (2) | Luce's Seamanship. |
| Ordnance and Gunnery | W. (3) F. S. (1) | Ordnance and Armor. |
| Steam-engineering | M. Th. (3) T. (2) | Marine Engines. |
| Astronomy, Navigation and Surveying | M. T. W. Th. (1) | Navigation and Surveying. |
| Mechanics and Applied Mathematics | T. (2) | Elective course in Naval Architecture. |
| English Studies, History, and Law. | T. F. (3) | Public Law. |
| Physics and Chemistry | F. (2) | Electricity. |
| Modern Languages | Th. (2) | French, and Elective course in Spanish. |

### CADET-ENGINEERS.

| Departments. | Periods. | Subjects. |
|---|---|---|
| | FOURTH CLASS—FIRST YEAR. | |
| Mathematics | M. T. W. Th. F. (2) S. (1)<br>M. (3) | Algebra and Geometry.<br>Elective course once a week.<br>Descriptive Geometry. |
| Steam-engineering | W. F. (3) | Mechanical Drawing. |
| English Studies, History, and Law. | M. T. W. Th. F. (1) | English and History. |
| Modern Languages | T. Th. (3) | French, and Elective course in Spanish. |
| | THIRD CLASS—SECOND YEAR. | |
| Mathematics | M. T. W. Th. F. (1)<br>F. (3) | Analytical Geometry and Descriptive Geometry.<br>Elective course once a week.<br>Descriptive Geometry. |
| Steam-engineering | Th. (3) | Mechanical Drawing. |
| Physics and Chemistry | T. (3) Th. (2) S. (1) | Elementary Physics. |
| English Studies, History, and Law | M. W. (3) T. (2) | English and History. |
| Modern Languages | M. W. F. (2) | French, and Elective course in Spanish. |
| | SECOND CLASS—THIRD YEAR. | |
| Astronomy, Navigation, and Surveying | Th. (2) F. (3) | Descriptive Astronomy. |
| Steam-engineering | T. W. Th. (3) F. (2) | Mechanical Drawing, Fabrication of Machinery, and Marine Engines. |
| Physics and Chemistry | M. W. (2) | Heat. |
| Mechanics and Applied Mathematics | M. T. W. Th. F. (1) | Mechanics.<br>Elective course twice a week. |
| English Studies, History, and Law | One period a month | English studies. |
| Modern Languages | M. (3) T. (2) S. (1) | French, and Elective course in Spanish. |
| | FIRST CLASS—FOURTH YEAR. | |
| Steam-engineering | M. T. W. Th. F. (1) T. (2) Th. (3) | Marine Engines, Fabrication and Designing of Machinery, and Mechanical Drawing. |
| Physics and Chemistry | M. W. (3) F. (2) | Physical Measurements, Electricity. |
| Mechanics and Applied Mathematics | M. W. (2) S. (1) | The Method of Least Squares.<br>Naval Architecture.<br>Elective course in Naval Architecture. |
| English Studies, History, and Law. | T. F. (3) | Public Law. |
| Modern Languages | Th. (2) | French, and Elective course in Spanish. |

# EXAMINATION PAPERS—1878-79.

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## FOURTH CLASS.

## DEPARTMENT OF MATHEMATICS.

### ALGEBRA.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, five hours.*

[Two questions may be omitted.]

1. Simplify $a(b+c)(b^2+c^2-a^2)+b(a+c)(a^2+c^2-b^2)+c(a+b)(a^2+b^2-c^2)$.

Multiply $\dfrac{x+\sqrt{y}}{x-\sqrt{y}}-\dfrac{x^2+y-x\sqrt{y}}{x^2+y+x\sqrt{y}}$ by $\dfrac{x-\sqrt{y}}{x+\sqrt{y}}-\dfrac{x^2+y+x\sqrt{y}}{x^2+y-x\sqrt{y}}$.

2. Reduce $1-\left\{\dfrac{a^2+b^2-c^2-d^2}{2(ab+cd)}\right\}^2$ to the form of a fraction and separate the numertor into four factors. Find the *g. c. d.* of $px^3-(p-q)x^2+(p-q)x+q$, and $x^3-(p+q)x^2+(p+q)x-q$. If $\dfrac{x+a}{a}=\dfrac{m}{n}$, what is the value of $\dfrac{x+a}{x-a}$?

3. Find the product of $x+y+z^{\frac{1}{2}}-2y^{\frac{1}{2}}z^{\frac{1}{4}}+2z^{\frac{1}{4}}x^{\frac{1}{2}}-2x^{\frac{1}{2}}y^{\frac{1}{2}}$, and $x+y+z^{\frac{1}{2}}+2y^{\frac{1}{2}}z^{\frac{1}{4}}-2z^{\frac{1}{4}}x^{\frac{1}{2}}-2x^{\frac{1}{2}}y^{\frac{1}{2}}$. Divide $a^3+8b^3+27c^3-18abc$ by $a^2+4b^2+9c^2-2ab-3ac-6bc$.

4. Express $\dfrac{1}{\sqrt{2}+\sqrt{3}+\sqrt{5}}$ with a rational denominator.

Simplify

$$\sqrt{a+b+c+2\sqrt{ac+bc}}, \text{ and}$$

$$\frac{7+\sqrt{-3}}{2-\sqrt{-3}}+\frac{8+3\sqrt{-3}}{2+\sqrt{-3}}-\frac{4(2-\sqrt{-3})}{1-\sqrt{-3}}$$

5. The equation $x^2+y^2+Ax+By+C=0$ is satisfied when $x=15$, $y=10$, when $=14$, $y=3$, and when $x=6$, $y=7$. Find $A$, $B$, and $C$.

6. Solve the equations $\frac{1}{2}\left(x-\frac{51}{26}\right)-\frac{1}{13}\left(2-6x\right)=x-\frac{1}{39}\left(5x-\frac{10-3x}{4}\right)$, and

$$\sqrt{y}-\sqrt{y-x}=\sqrt{20-x}, \quad \sqrt{\frac{y-x}{20-x}}=\frac{3}{2}.$$

7. Solve the equations $x^2+17x-18=0$, $(x+7)^{\frac{1}{4}}+\frac{3}{4}(x+7)^{\frac{1}{2}}=5$, and

$$\sqrt{\frac{x}{y}}+\sqrt{\frac{y}{x}}=\frac{10}{3}, \quad x+y=10.$$

8. Given $(y-2x)(y^2-x^2)-a(y-x)^2+4a^2(x+y)-a^3=0$, find $x$ and $y$, (1) when $=y$, (2) when $y=2x+\frac{a}{3}$, (3) when $y=-x+\frac{2a}{3}$.

9. Find $x$ and $y$ from $x^4+y^4=3x^2y^2+2xy+1$, $x^3+y^3=2xy^2+2y^2+x+1$.

10. Find the value of $\dfrac{(a^3-3a)(x^2-y^2)+2xy(1-3a^2)}{(1-3a^2)(y-xz)(y-ax)}$, given

$$y=x\,\frac{a+\sqrt{3}}{1-a\sqrt{3}}, \quad z=\frac{a-\sqrt{3}}{1+a\sqrt{3}}.$$

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, three hours.*

[One question may be omitted.]

1. Write five terms of the expansion of $(x+y)^n$. Expand $(2x+3y)^4$, and $(x+y+z)^3$. Expand $(a^3-x^3)^{\frac{1}{3}}$ to five terms and use the result to find $\sqrt[3]{999}$ to five decimal places.

2. Find five terms of $\sqrt{1+x+x^2+x^3}$ by means of indeterminate coefficients. Separate $\dfrac{x^3-x^2-x-1}{x(x^2-1)(x^2-9)}$ into five fractions with denominators of the first degree.

3. Define a logarithm, and the terms *base, characteristic, mantissa, modulus.* Find the value of each of the following expressions by means of logarithms: $(.0037581)^2$, $(.027562)^{\frac{1}{8}}$, $\dfrac{.0034789}{.000075634}$, $x^x$ when $x=3.1416$, and also when $x=.031416$.

4. Find the value of the expression $\left\{\dfrac{a^{\frac{3}{2}}b^3c^{\frac{1}{7}}d}{e^2f^3g}\right\}^{\frac{1}{7}}$, given $a$, 386.07; $b$, .059563; $c$, .00078568; $d$, 99878000; $e$, 432750; $f$, .000064852; $g$, 22755.

5. Form an equation whose roots are $2\pm\sqrt{5}$ and $3\pm\sqrt{-1}$. Find what the equation $x^4-12x^3+54x^2-30x+1=0$ becomes (1) when it is deprived of its 2d term, (2) when its roots are *increased* by 2, (3) when its roots are doubled. Find what the equation $x^4-18x^3-60x^2+x-2=0$ becomes when the third term is removed. Find the roots of the equations $x^4-3x^3-15x^2+19x+30=0$ and $x^5-4x^4+x^3+x^2-4x+1=0$.

6. Eliminate $y$ between the two equations

$$\left.\begin{aligned} ay^2+by+c&=0\\ a_1y^2+b_1y+c_1&=0\end{aligned}\right\}.$$

Apply the result to eliminate $m$ between the equations

$$\begin{gathered}(x^2-y^2)m^2+a(x+y)m+a(x-y)=0\\ (x^2+y^2)m^2+a(x-y)m-a+(x-y)=0.\end{gathered}$$

## GEOMETRY.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, three hours.*

[One question may be omitted.]

1. Prove that the sum of the angles of a triangle is two right angles; that the line parallel to the base bisecting one side of a triangle bisects the other side, and is equal to one-half the base, and in a right triangle that the line drawn from the vertex of the right angle to the middle of the hypothenuse is equal to one-half the hypothenuse.

2. Prove that the medial lines of a triangle meet in a point; construct a triangle given two sides and an angle opposite one of them. Discuss this case, showing when there is one solution, when two, and when none. Draw a common *interior* tangent to two circles, and prove the construction.

3. Prove that in any circumscribed quadrilateral the sum of two opposite sides is equal to the sum of the other two. *State* a proposition by means of which we may construct a mean proportional between two lines. How would you construct a line $\sqrt{18}$ in. in length? Prove that if in any triangle a medial line is drawn from the vertex to the base, (1) the sum of the squares of the two sides is ——, (2) the difference of the squares of the two sides is ——, and that in any quadrilateral the sum of the squares of the four sides is ——.

4. Show how to inscribe the following regular polygons in a circle: square, hexagon (proof), decagon (proof). The radius being $a$, find the length of a side of the inscribed *triangle, square, octagon,* and *decagon.*

5. Prove that the volume of any parallelopiped is equal to the product of its base and altitude; that a triangular pyramid is one-third of a prism of the same base and

ltitude; and that the frustum of a triangular pyramid is equivalent to the sum of hree pyramids, &c. (State the proposition in full.)

6. $O A$ and $O B$ are at right angles, $O A=a$, $O B=b$. Draw $O C P$ perpendicular to $B$ and meeting $A B$ at $C$, and make $C P=A C$, draw $P Q$ parallel to $O A$, meeting $O$ at $Q$. It is required to find expressions for $O Q$ $(x)$ and $P Q$ $(y)$ in terms of $a$ and , and to prove that if $A B=c$, then $(x^2+y^2)^3=c^2 x^2(x+y)^2$.

## THEORY OF EQUATIONS.

### ELECTIVE COURSE.

JUNE, 1879.—*Time allowed, two hours.*

*adet-Midshipmen Lewis Nixon and W. T. Paine. Cadet-Engineers W. H. P. Creighton and Emil Theiss.*

1. Solve the equation $x^3+qx+r=0$. What is the relation between $q$ and $r$ when n equation of the above form has equal roots? Prove that the condition which must old in order that $ax^3+bx^2+cx+d=0$ may have equal roots is

$$(9ad-bc)^2-4(b^2-3ac)(c^2-3bd)=0.$$

2. Solve the equation $x^4+qx^2+rx+s=0$, and apply the method used in your soluion to find the roots of the equation $x^4+8x^3+20x^2+19x+12=0$.

3. Find a root of the equation $x^4-6x^3+5x^2+14x-4=0$ to five decimal places.

4. Trace the loci of the equations $y^2=ax$, $y^3=a^2x$, $x^5+a^4y=0$, $2y^5-10xy^3+15x^3=0$, nd $x^3-xy^2+a(4x^2-y^2)=0$.

# EPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

## ENGLISH GRAMMAR.

### SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, four hours.*

I. (*a*) Name the foreign elements in the English language in the order in which heir influence was exerted.

(*b*) Describe the circumstances which led to any one of these influences, and characerize briefly its effect on the language.

(*c*) Explain the terms: 1. Welsh; 2. England; 3. Briton; 4. Norman; 5. Analytic tage in a language; 6. Langue d'oil; 7. Revival of letters.

II. (*a*) Classify the tenses of the verb according to the time and character of the ction expressed.

(*b*) Give the possessive singular and plural of *glass*, *reef*, *goose*, *play*, *Hindoo*, *seraph*, *on-in-law*, *sheaf*, *pulley*. Explain the origin of the possessive-case ending.

III. (*a*) Explain the gradual simplifying of the order of words in a sentence, in the rogress of the language.

(*b*) Give an account of the spoken and written language of England from 1066 to 385. What is the significance of the latter date?

(*c*) Explain the case of extension.

IV. Analyze the following:

(1) Oh, who can tell, save he whose heart hath tried,
(2) And danced in triumph o'er the waters wide,
(3) The exulting sense—the pulse's maddening play,
(4) That thrills the wanderer of that trackless way;
(5) That seeks what cravens shun with more than zeal,
(6) And where the feebler faint, can only feel—
(7) Feel—to the rising bosom's inmost core
(8) Its hope awaken and its spirit soar!

V. (*a*) Explain the comma after *Oh* (1) and *tell* (1); the dashes in (3), (6), and (7); the semicolon in (4).

(*b*) Classify the following and explain their formation: *Maddening*, (3); *trackless*, (4); *inmost* (7); *awaken* (8). Explain the force of *er* in *feebler;* in the second syllable of *wanderer;* in the third syllable.

(*c*) Explain the words *that* and *what* as they occur in (4) and (5).

VI. "As the news spread, a moment later, squares and market-places broke *forth* into acclamations. Yet were the rejoicings *less strange* than the *weeping.* For the feelings of men had been wound *up* to *such* a point *that*, at length, the stern English nature, so *little used** to outward emotion, gave *way*, and *thousands* sobbed* *aloud* for *very* joy Never within the memory of the oldest, not even on *that* night when it was known *that* the army had declared* for the Parliament, had *there* been such *rejoicings*." Explain the construction of the words in italics.

VII. (*a*) Explain formation of news, market-places, outward, oldest.

(*b*) Give principal parts of all the verbs in VI, except those starred, explaining and classifying all the forms.

## HISTORY.

### SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, four hours.*

1. Give the geographical position of the following nations, and state to what family of races they belong: 1. Phœnicians; 2. Bulgarians; 3. Magyars; 4. Lithuanians; 5. Roumanians; 6. Basques.

2. State the three titles borne by Charles the Great before he was emperor, and show how he got each of them. What was the ground of Charles's claim to be Roman emperor?

3. Who were the Patricians? How was their power reduced? Describe the class that succeeded to their position in the commonwealth, and show how the existence of this class tended to keep the government aristocratic. What is meant by saying that the establishment of the Empire was not a formal revolution?

4. Connect the following dates, stating briefly the historical significance of the events referred to in the series: 622, 632, 710, 732, 1099, 1187, 1291, 1453, 1492, 1571.

5. What was the German feeling in regard to towns? How was this illustrated in Britain? How was this feeling afterwards changed, and what brought about the change?

6. Describe the origin of the United Provinces, and show how they became one of the chief powers of Europe.

7. State the circumstances that gave rise to the League of Cambray. State the extent of the dominions of Charles V., and show by a genealogical table how he came into possession of each of them.

8. Explain the origin and meaning of the following names: 1. Lorraine; 2. Provençal; 3. Iconoclast; 4. Dauphin; 5. Sultan of Rome; 6. King of the Romans; 7. Caliph.

9. "For the very reason that the French Kings had once had much less power than the Emperors or the English Kings, they came in the end to have much more power than either of them." Explain fully, showing what effect the feudal system had upon popular assemblies in different states of Europe.

10. Draw a map of Europe at the end of the Vth Century, putting down the boundaries of the Roman Empire, Kingdoms of the Franks, Burgundians, East-Goths, and West-Goths, and the following places: Toledo, Ravenna, Toulouse, Tours, Milan, Geneva, Aachen, Trier, Arles, Avignon, Pisa, Basel, Byzantion, Hadrianople; and the following rivers: Danube, Rhone, Eider, Rhine, Ebro, Loire, Po, Weser, Seine.

## HISTORY OF THE UNITED STATES.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, four hours.*

1. Explain tariff, protection, excise, strict constructionist, Monroe doctrine, Hart-rd convention.

2. State the form of government in each colony at the Revolution, and give a brief ccount of each of the prevailing forms.

3. Explain the terms "Federal" and "Republican" as applied to the Government of he United States, and show that these two principles have a historical basis.

4. What were the Articles of Confederation? When were they in operation? What vere their defects?

5. Give some account of (1) Webster-Ashburton treaty, (2) Alabama claims, (3) rench war of 1798.

6. Explain the Navigation Acts and their object.

7. Give an account of the battle of Gettysburg, and the circumstances which preceded nd followed it.

8. The treaty with France in 1778; by whom was it brought about, and what were ts results?

9. Show how and when the Massachusetts charter was lost, and in what form it was ecovered.

10. Draw a map of the Louisiana cession of 1803, and of the territory from which lavery was excluded by the Missouri Compromise.

## ENGLISH.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, four hours.*

I. Discuss the value of arguments from analogy.

II. In what way and with what limitations may speech be said to be the guide to vritten prose?

III. Explain personal metaphor, fine writing, partial induction, novel and romance, ssentials and accidents.

IV. Show by the method of elimination the difference in meaning of the following vords: Expedient, convenient, opportune.

V. Explain the formation of the words *interval* and *camp*, showing what law of change ach illustrates.

VI. Correct and point out the faults in the following: "I expect my folks lives most ll of nine miles from Lake Erie; it's sort of lonesome out there, but it ain't a great vays to go for an individual raised in Maine, and I'd as lives go as not."

VII. "By making the same man a capitalist and a workman, coöperation enables im to understand the difficulties of an employer's position." Supply what is want-ng, put in the form of a syllogism, and point out the various premises and terms.

VIII. "The Lord Chancellor had been guilty of criminal laxity in office, but this vas explained by the immense demands of his position, and atoned for by the special abors he had undertaken." Put in the form of a syllogism, explain the error, and draw a diagram.

IX. Explain the figures in the following passage, and expand, as far as they admit of expansion:

"What are thine hopes, Humanity?—thy fears?
Poor voyager, upon this flood of years,
Whose tide, unturning, hurries to the sea
Of dark unsearchable eternity;
The fragile skiffs, in which thy children sail
A day, an hour, a moment, with the gale,
Then vanish:—gone like eagles on the wind,
Or fish in waves, that yield and close behind?
Thine hopes,—lost anchors buried in the deep,
That rust, through storm and calm, in iron sleep."

## DEPARTMENT OF MODERN LANGUAGES.

### FRENCH.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, four hours.*

Translate into French the following sentences:

1. Tell me what you know of Robert Fulton's history. When and where was he born?
2. Robert Fulton was born in the United States in 1765.
3. He was, without doubt, the child of rich parents?
4. On the contrary, his parents were very poor.
5. How did he begin life?
6. As soon as he knew how to read and write, he was placed in apprenticeship at a jeweler's.
7. And later?
8. Later he started for England and studied mechanics.
9. They say that he invented many things?
10. Yes, from that time he invented incessantly.
11. Have his inventions been adopted?
12. Later his inventions were adopted and put in practice by America and England.
13. Why do you say "later"?
14. Because at first the public and the English Government did not pay much attention to it.
15. In presence of this difficulty, what did Fulton do?
16. Hoping to find more encouragement in France, he crossed the channel and arrived in Paris in 1796.
17. With what did he occupy himself in France?
18. He worked for several years at a new war engine invented by himself.
19. Without doubt the government aided him?
20. At first the government gave him help, then forsook him.
21. It was that which assuredly decided him to leave France?
22. Yes, but he met one of his countrymen, who lent him funds.
23. How did he employ that money?
24. He built a large steamboat.
25. Was it a success?
26. Without doubt. He proved it successful in 1803.
27. What did those who saw the experiment do?
28. They were not long in forgetting it.
29. This is very astonishing; how can you explain it?
30. It was at the time Napoleon was so victorious, when all France was watching her Emperor.
31. Very well. But I suppose Fulton could not have been very well satisfied. What did he do then?
32. He returned to America and built a new steamboat.

### GRAMMAR.

Give the plural of the following nouns:—

I. Those ending in the singular in *s*, *x*, and *z*.

II. Nouns ending in *au* or *eu*.

III. Nouns ending in *al*.

IV. Give the feminine of the adjectives *heureux*, *bon*, *fou*, *content*.

V. Explain the rule about *vingt*, *cent*, and *mille*.

VI. How do adjectives agree with the nouns qualified?
VII. What is the place of the adjectives in French?
VIII. Give some of the adjectives which do not follow the general rule.
IX. How many articles are there in French?
X. How many genders are there?
XI. Is there any rule for distinguishing gender?
XII. Explain what is meant by "a partitive sense".
XIII. Explain the use of *à*, *dans*, and *en*.
XIV. Give in a table—
   (*a*) The present indicative, first person singular and plural,
   (*b*) The imperative, second person singular,
   (*c*) The present subjunctive, third person singular and plural,
   (*d*) The future first and second person singular,
of *aller*, *partir*, *devoir*, and *venir*.

*Translate the following into English:*

LES AVENTURES DE TÉLÉMAQUE. LIVRE PREMIER.

Calypso ne pouvait se consoler du départ d'Ulysse. Dans sa douleur, elle se trouait malheureuse d'être immortelle. Sa grotte ne résonnait plus de son chant, les ymphes qui la servaient n'osaient lui parler. Elle se promenait souvent seule sur es gazons fleuris dont un printemps éternel bordait son île; mais ces beaux lieux, loin le modérer sa douleur, ne faisaient que lui rappeler le triste souvenir d'Ulysse, qu'elle y vait vu tant de fois auprès d'elle. Souvent elle demeurait immobile sur le rivage de a mer, qu'elle arrosait de ses larmes; et elle était sans cesse tournée vers le côté où vaisseau d'Ulysse, fendant les ondes, avait disparu à ses yeux.

Tout-à-coup elle aperçut les débris d'un navire qui venait de faire naufrage; des ancs de rameurs mis en pièces, des rames écartées çà et là sur le sable, un gouvernail, n mât, des cordages flottant sur la côte. Puis elle découvre de loin deux hommes, ont l'un paraissait âgé; l'autre quoique jeune, ressemblait à Ulysse. Il avait sa ouceur et sa fierté, avec sa taille et sa démarche majestueuse. La déesse comprit ue c'était Télémaque, fils de ce héros; mais, quoique les dieux surpassent de loin en onnaissance tous les hommes, elle ne put découvrir qui était cet homme vénérable ont Télémaque était accompagné. C'est que les dieux supérieurs cachent aux inférieurs tout ce qui leur plaît, et Minerve, qui accompagnait Télémaque sous la figure e Mentor, ne voulait pas être connue de Calypso.

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## THIRD CLASS.

## DEPARTMENT OF MATHEMATICS.

### TRIGONOMETRY.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, five hours.*

*Without tables.*

[Two questions may be omitted.]

1. What is the circular measure of an arc? What is the unit of circular measure? ind the length of the unit in degrees, minutes, and seconds. Define the secant of an ngle; what values of $x$ make each of the expressions $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$, $\sec{}^{1}x$, npossible? Write the sec, cosec, and cot of $\left\{\frac{n\pi}{2} \pm y\right\}$ making $n$ successively 2, 5, nd 7. Write a general expression (1) for all the angles which have the same sine as he angle $a$, (2) for all angles which have the same cosine, (3) for all angles which ave the same tangent.

2. Make a table showing the sine, cosine, tangent, and versine of the angles 0°, 15°, $22\frac{1}{2}°$, 30°, 45°, 60°, $67\frac{1}{2}°$, 75°, 90°, and of the supplements of these angles. The method of obtaining the functions of 15° and $22\frac{1}{2}°$ must be shown. Square roots are to be indicated only.

3. Assuming the formulas for the sine and cosine of $(x \pm y)$, deduce the formulas $\sin x \pm \sin y = \ldots$, $\cos x \pm \cos y = \ldots$, and formulas for the sine, cosine, and tangent of $2x$ and $\frac{1}{2}x$. Simplify the expression $\tan\left(\frac{\pi}{4}+\frac{y}{2}\right)+\tan\left(\frac{\pi}{4}-\frac{y}{2}\right)$. Write $\sin 5\phi$ in terms of $\sin\phi$.

4. Write the formulas for the solution of a plane right triangle ($C$ the right angle), (1) when $c$ and $A$ are given, (2) when $b$ and $c$ are given, (3) when $a$ and $b$ are given. Solve a right triangle, the hypothenuse being $c$ and the angle $A = \tan^{-1} x$. Find the sine of the angle between two faces of a regular tetraedron. Solve the equation $\tan 3\theta + \tan 2\theta + \tan\theta = 0$.

5. Prove that in a plane triangle $\frac{a+b}{a-b} = \frac{\tan\frac{1}{2}(A+B)}{\tan\frac{1}{2}(A-B)}$, and $a^2 = b^2 + c^2 - 2bc\cos A$. Deduce the formulas for $\sin^2\frac{1}{2}A$, and for $K$. Deduce formulas for the solution of a plane triangle by means of a perpendicular, (1) when two sides and an angle opposite are given, (2) when the three sides are given.

6. State the fundamental theorems of Spherical Trigonometry; deduce directly from these theorems the formulas for the solution of the right spherical triangle, given $a$ and $c$. State Napier's rules in full. Apply the following formulas to the polar triangle: $\text{Cos}^2\frac{1}{2}b = \frac{\cos(S-C)\cos(S-A)}{\sin C\sin A}$, and $\sin S = \frac{\sin\frac{1}{2}a\sin\frac{1}{2}b\cos C + \cos\frac{1}{2}a\cos\frac{1}{2}b}{\cos\frac{1}{2}c}$.

7. Deduce the first and second of Napier's Analogies. Given $d$, 15° $N$; $L$, $\tan^{-1}\frac{2+\sqrt{3}}{2}$ $N$; find the time of sunset.

8. Solve the equations, $\cos^3\theta\sin 3\theta + \sin^3\theta\cos 3\theta = \frac{3}{4}$, and $\tan^{-1}(x-1) + \tan^{-1}x + \tan^{-1}(x+1) = \tan^{-1}3x$. Eliminate $\phi$ between the two equations, $y = x\tan\phi + a\cot\phi$; $y = x\tan\left(\frac{\pi}{2}+\phi\right) + a\cot\left(\frac{\pi}{2}+\phi\right)$.

9. Find the relation between the sides $a$, $b$, and $c$ of a plane triangle when the angle $A$ is double the angle $B$. Show that this is impossible unless $\frac{b}{a}$ is greater than $\frac{1}{2}$ and less than 1.

10. Find the relation between the sines of the sides of a spherical triangle when the angles $A$, $B$, and $C$ are proportional to the numbers 1, 2, and 3.

## SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, five hours.*

### *Practical work.*

[One question may be omitted.]

1. Take from the tables the following logarithms, prefixing to each the sign of the function: Cosine 96° 30′ 35″, tangent 251° 20′ 30″, secant 269° 38′ 45″, cosecant 351° 29′ 29″, secant 189° 10′ 10″, cotan 0° 30′ 30″. Find the angles corresponding to the following tabular logarithms in the quadrant indicated: Cotan 9.14473 (2d), sine 8.05462 (3d), tan 9.25442 (3d), and secant 10.74568 (4th). Find the circular measure of $\cot^{-1}\frac{3}{2}\sqrt{11}$.

2. In a plane triangle, given $A$, 51° 30′ 40″; $a$, 38.532; $b$, 42.175; solve the triangle and find the area.

3. In a plane triangle, given $a$, 61.267; $b$, 38.809; and $c$, 57.912, find the angles and the radii of the inscribed and circumscribed circles.

4. In a spherical right triangle, given $A$, 69° 30′ 45″; $b$, 119° 30′ 40″; solve the triangle. In a quadrantal triangle, given $c$, 90°; $a$, 75° 20′ 20″; $b$, 131° 13′ 20″; solve the triangle.

5. Given $t$, 40° 41′ 58″; $L$, 22° 30′ 40″ $N$; $d$, 21° 40′ 40″ $S$; find $h$ and $Z$, and with the same latitude and declination find the time of sunset.

6. Given $A$, 140° 15′ 30″; $B$, 132° 16′ 30″; $a$, 127° 30′ 30″; solve the triangle.

7. Given $a$, 118° 23′; $b$, 40° 6′ 30″; $B$, 29° 41′ 30″; solve by means of Napier's Analogies.

8. Find the value of the expression—

$$\frac{m\,(m+n)\sin\beta}{\sqrt{m^2\sin^2\beta+n^2\sin^2\alpha-2mn\,\sin\alpha\,\sin\beta\,\cos(\alpha+\beta)}},$$

given $m$, 310.45; $n$, 200.48; $\alpha$, 38° 30′ 30″; $\beta$, 22° 30′ 30″.

9. Three stations, of which the first is $m$ yards from the second, and the second $n$ yards from the third, and which lie in the same straight line, are viewed from a fourth station; the distance between the first and second stations subtends an angle $\alpha$, and the distance between the second and third subtends an angle $\beta$. Find the distance from the first station to the fourth, when $m$, $n$, $\alpha$, and $\beta$ have the same values as given in question 8.

## ANALYTICAL GEOMETRY.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, three hours.*

[One question may be omitted.]

1. Write the equations to the following lines, ($a$) through (2, 6) and (3, 2), ($b$) through (1, 5) perpendicular to $3y-4x=5$. Find the length of the perpendicular from (3, 4) upon $5y-12x+8=0$, and find the tangent of the angle between $2y-3x+5=0$, and $3y-4x+6=0$.

2. Deduce the rectangular equation to the circle; find the equation to a circle which passes through (8, 6), (1, 5), and (9, —1). Find the equations to tangents to $x^2+y^2-10x-4y+4=0$ which pass through (12, 3).

3. Deduce the equation to the parabola. Find the length of a perpendicular from the focus upon a tangent, (1) in terms of $x$, (2) in terms of $m$. Prove that tangents at the extremities of a focal chord are perpendicular to each other and meet on the directrix. Find the equation to the locus of the middle points of focal chords.

4. Deduce the polar equation to the ellipse by moving the origin to the left-hand focus and then transforming to polar co-ordinates. Find the length of a focal chord. Explain the eccentric angle (figure), and find the co-ordinates of a point on the ellipse in terms of it. Prove that the eccentric angles of the vertices of conjugate diameters differ by 90°. The major axis of an ellipse is $2a$ and the foci are midway between the vertices and centre; find the equation to the ellipse and its eccentricity.

5. Deduce the equation to an hyperbola referred to its asymptotes, and prove that the two portions of any secant included between the curve and asymptotes are equal. Construct the loci of the two equations $y^2+8xy+16x^2-8y-33x+16=0$ and $2y^2-5xy+2x^2-4y-4x+2=0$.

6. Trace the loci of the following equations:

$$a(y^2-x^2)(y-2x)-y^4=0, \quad (y-x)\,(y-4x)\,(y+2x)=a^3,$$
$$(y-x)\,(y-4x)\,(y+2x)=8ax^2, \text{ and}$$
$$(x^2+y^2)^3=c^2x^2(x+y)^2.$$

## DIFFERENTIAL AND INTEGRAL CALCULUS.

### ELECTIVE COURSE.

JUNE, 1879.—*Two papers, two hours each.*

*Cadet-Midshipmen J. L. Schock, J. H. Linnard, J. L. Rees, F. C. Rider, J. J. Woodward, J. A. Hoogewerff, Eugene Carroll, Tasuker Serata, H. K. White, and F. E. Sutton.*
*Cadet-Engineers J. M. Whitham, and Gustave Kaemmerling,*

### I.

1. Evaluate the following expressions:

$$\left.\frac{\varepsilon^{x}-\varepsilon^{-x}-2x}{x-\sin x}\right]_0, \quad \left.\frac{\log x}{x}\right]_\infty, \quad \left.\frac{\log\sin 2x}{\log\sin x}\right]_0, \quad \left. x\tan x-\frac{\pi}{2}\sec x\right]_{\frac{\pi}{2}}.$$

2. Given the fixed line

$$\frac{x}{a}+\frac{y}{b}=1$$

(axes rectangular), through the origin draw a line $OS$, cutting the given line at $S$, and let $R$ be the foot of the ordinate to the point $S$, through $R$ draw a perpendicular to $OS$. It is required to find the envelope of this perpendicular, and to make a sketch of the curve.

3. The equation to a curve is

$$r=\frac{a\cos 3\theta}{\sin 4\theta};$$

find $p$, and make a sketch showing the asymptotes in position.

4. Trace the curve $x^5-ax^4-a^3xy+ay^4=0$, and find the tangents to the curve at the points where it crosses the axis of $X$. Trace the curve $ax^2-x^2y-a^2y=0$, and find the points of inflexion.

5. Trace the curve $y(y-x)^2(y+2x)-4a^2x^2=0$.

### II.

Integrate the following expressions :—

1. $$\int\frac{dx}{\sqrt{x}}, \qquad \int^{0}\frac{\sin\theta\,d\theta,}{\cos^2\theta}, \qquad \int\frac{dx}{a+bx^2}.$$

2. $$\int\frac{dx}{x^2-a^2} \qquad \int\frac{\varepsilon x\ dx}{1+\varepsilon^2x}, \qquad \int\frac{dx}{x^2\sqrt{1+x^2}}.$$

3. $$\int\varepsilon^{ax}x\,dx, \qquad \int\frac{(2x+3)\,dx}{x^3+x^2-2x}, \qquad \int\sin^3\theta\cos^7\theta\,d\theta.$$

4. Find the whole area enclosed by the curve $a^2y^2-2ax^3+x^4=0$.

If a plane be passed through the middle point of a radius to a sphere and perpendicular to the radius, find the volume of the solid cut off.

5. If the curve $y^2(x-4a)=ax(x-3a)$ revolve about the axis of $X$, find the volume generated from $x=0$ to $x=3a$.

## DEPARTMENT OF PHYSICS AND CHEMISTRY.

### ELEMENTARY PHYSICS.

ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, three hours.*

1. Describe the method of measuring the velocity of sound in gases.

2. The coefficient of expansion of brass is .000019; of steel is .000011. A brass bar neasures 820 mm. on a steel metre scale, both bar and scale at 10° C. What will it neasure when both are at 50° C?

3. What are the laws of single refraction? Define the index of refraction and the ritical angle, and express their relation.

4. A spherical mirror has a radius of curvature of 60 cm. An object 10 cm. high is laced 80 cm. from its surface. Give position and size of image.

5. What is a prism? Why does it disperse white light? What are the properties f the different parts of the solar spectrum? Why cannot good photographs of the eaves of plants be obtained?

6. The index of refraction of water is 1.336; of glass, 1.54. A glass prism whose efracting angle is 60° is immersed in water. What is the deviation of a ray of light hat on striking the prism makes an angle of 20° with the normal?

7. Define the optical centre of a lens. Show how the images are formed in the imple microscope, compound microscope, and celestial telescope.

8. The refracting angle of a prism is 64°. What is the angle of incidence of a ray hat makes the critical angle with the normal to the opposite side? $u=1.54$.

9. Given a gold-leaf electroscope and an insulated box positively charged, how can ou give the electroscope a permanent negative charge? Describe the action of the lectrophorus.

10. Indicate by arrows the direction of the current in the diagram. Will the end of the astatic needle move above or below the paper?

### CHEMISTRY.

ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, five hours.*

1. What are the relative advantages of Chili and India saltpeter for use in gunowder? How may they be distinguished from each other? What are the sources f these salts, and what is the theory of their formation?

2. Give the members of the chlorine group and show the relation between them.

3. Define an acid; a base; a salt.

4. Given $ZnCl_2$, $HCl$, $H_2O$, $FeO$, $FeS$, $NH_4Cl$, show the quantivalence of each lement. Define quantivalence.

5. The valencies of K, Ba, Bi, and Si being respectively one, two, three, and four, rite the hydrates of these elements.

6. Describe hydrogen. Give the method for its preparation used in the laboratory. Vhat reasons have we for believing that its molecule contains at least two atoms?

7. Write the typical formulæ for calcic sulphate, plumbic nitrate, sodic chloride nd ammonia.

8. When copper is acted upon by sulphuric acid, we obtain cupric sulphate, water, nd sulphurous anhydride. Write the reaction.

9. From $\overline{cm}^3$ of P (sp. gr. 1.8) what volume of gaseous hydrogen phosphide will be btained at 15° C. and 74 cm. pressure? What are the properties of the hydride?

10. Write the chemical names for $Ag_2S$, $Pb(NO_3)_2$, $H_2SO_4$, $H_2SO_3$, $Na_2SO_3$, $Ba(ClO,)_2$

11. Calculate the percentage composition of potassic chlorate.
12. Describe sulphurous anhydride and explain its use as a bleaching agent.

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## DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

### CONSTITUTION OF THE UNITED STATES.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, four hours.*

1. Define writ of mandamus, ex post facto law, bill of attainder, concurrent and exclusive jurisdiction, letter of marque, writ of habeas corpus, common law, writ of error.

2. Explain the formation of the State of West Virginia, quoting the constitutional clause applicable to the subject. Explain the position of Missouri during the civil war. Describe the restoration of Tennessee to the Union.

3. With whom rests the power to impeach? to try impeachments? to suspend public officers in recess? to expel members of Congress? to remove disabilities from persons formerly in rebellion? to suspend the writ of habeas corpus? to originate revenue bills? to call for the yeas and nays? to regulate the time, place, and manner of holding elections of Senators? to make treaties?

4. Describe the principal form in which Congress has exercised the power to borrow money. What is the meaning of the phrase "legal tender"? What change was made in the legal tender in 1853? in 1862? in 1877? "The present government paper circulating as money is a government loan—a forced loan." Explain.

5. State the provisions of the Constitution in regard to the power of Congress to lay taxes in general; to lay direct taxes; to lay duties on exports. What is provided as to duties levied by the States? Explain fully all the kinds of taxes referred to in these clauses.

6. Show why a State legislature cannot revoke its own grants. How are city charters regarded in this connection? What was the Dartmouth College case, and what bearing does it have on the subject?

7. Describe the organization of the four classes of United States courts. Enumerate the classes of cases in which the Supreme Court has (1) original jurisdiction, (2) appellate jurisdiction.

8. Explain fully the composition of each branch of Congress, the qualifications, mode of election, and term of office of its members, its numbers, and its exclusive powers.

### RHETORIC.

MONTHLY EXAMINATION.

MARCH 19, 1879.—*Time allowed, two hours.*

[Starred (*) questions are alternatives.]

1. Explain the importance of conjunctions in the structure of the paragraph. Explain the two principal classes of conjunctions. Explain cumulative, adversative and illative conjunctions, giving examples of each.

1.* Show when conjunctions may be omitted between consecutive sentences without any loss of explicit reference, and show in what other ways than by conjunction the reference may be expressed.

2. State the conditions that should be fulfilled in using figures (1) to aid the understanding, (2) to heighten the feelings. Distinguish between novelty, originality, and rarity.

2.* "The more general a notion is, the more difficult it is to conceive." Explain fully, and show what bearing this has upon attaiment of simplicity in style.

3. Give the various meanings of the rhetorical term "taste". Show that taste is, to some extent, a matter of personal peculiarity.

4. Show that originality is a condition of strength; and explain why compositions sometimes have the power to please after frequent repetition.

5. (For Cadet-Midshipmen). Write an official report, to the Commandant of Cadets, of an examination of Annapolis Harbor, stating landmarks, depth of water, anchorage, channels, security in bad weather and against an enemy.

(For Cadet-Engineers.) Write an official report, to the Commandant of Cadets, on the engines and machinery in the steam building.

[Official report will count double.]

## NAVAL HISTORY.

### MONTHLY EXAMINATION.

APRIL 23, 1879.—*Time allowed, two hours.*

1. What is a carronade? Describe the Greek trireme, and its use. What was the corvus of Duilius?

2. Explain the terms flush-deck, quarter-deck, line-of-battle, close-hauled line ahead, ship of the line, frigate, sloop-of-war.

3. Explain "breaking the line"; point out its advantages, and tell when and by whom it was first adopted in modern warfare. Explain the object of the manœuver as practiced in Greek tactics.

4. Give a brief account of the life and character of the earl of St. Vincent.

5. Watt, Fulton, Ericsson,—improvements or applications of the steam-engine.

6. Describe the three principal offensive and defensive weapons of naval warfare, and the relative range and power of the former.

7. Give a short and distinct account of the battle of Aboukir, with details as to single ships.

## NAVAL HISTORY.

### ANNUAL EXAMINATION.

MAY 31, 1879.—*Time allowed, four hours.*

1. Show how the introduction of (1) guns, (2) sails, (3) steam-engines, (4) armor, in ships of war, changed the methods of naval warfare.

2. Give an account of the relative force of the English and American navies, and of English and American ships in the war of 1812, showing in what way and to what extent these circumstances influenced the results.

3. Give a brief account of *Collingwood, Paul Jones, Dale, Lawrence.* Take two.

4. Describe briefly the battle of Trafalgar.

5. The affair of the Chesapeake and Leopard.

6. Give an account of Perry's victory on Lake Erie, with a statement of the forces engaged and attendant circumstances, and draw a diagram of the engagement.

7. Describe Preble's force before Tripoli, the force opposed to him, the character of the harbor and its defenses, and, in general, Preble's method of attack.

# DEPARTMENT OF MODERN LANGUAGES.

## FRENCH.

### ANNUAL EXAMINATION.

JUNE, 1879.

### JOSEPH BERTHA ET LE CONSEIL DE RÉVISION.

Le vieux gendarme Kelz, avec son grand chapeau à cornes, se promenait de long en large, devant la salle du conseil; dès qu'il me vit, il s'arrêta comme émerveillé, puis il s'écria :

A la bonne heure! à la bonne heure! au moins en voilà un qui n'est pas fâché de partir : l'amour de la gloire éclate dans ses yeux.

Et me posant la main sur l'épaule :

— C'est bien, Joseph, fit-il, je te prédis qu'à la fin de la campagne, tu seras caporal.

— Mais je suis boiteux! m'écriai-je, indigné.

— Boiteux! dit Kelz en clignant de l'œil et souriant, boiteux! C'est égal, avec une mine pareille on fait toujours son chemin.

Il avait à peine fini son discours, que la salle du conseil de révision s'ouvrit, et que l'autre gendarme, Werner, se penchant à la porte, cria d'une voix rude : Joseph Bertha! J'entrai, boitant le plus que je pouvais, et Werner referma la porte.

En me voyant, M. le sous-préfet dit : Voilà un garçon plein de santé.

Ces mots me mirent en colère ; malgré cela, je répondis honnêtement :

— Mais je suis boiteux, monsieur le sous-préfet.

Les chirurgiens me regardèrent, et celui de l'hôpital, à qui M. le commandant de place avait sans doute parlé de moi, dit :

— La jambe gauche est un peu courte.—Bah! fit l'autre, elle est solide.—Puis, me posant la main sur la poitrine : La conformation est bonne, dit-il; toussez. Je toussai le moins fort que je pus ; mais il trouva tout de même que j'avais un bon timbre.

— Regardez ces couleurs, dit-il, voilà ce qui s'appelle un beau sang.

Alors moi, voyant qu'on allait me prendre, si je ne disais rien, je répondis : J'ai bu du vinaigre.

— Ah! fit-il,, ça prouve que vous avez un bon estomac, puisque vous aimez le vinaigre.

— Mais je suis boiteux! m'écriai-je tout désolé.

— Bah ! ne vous chagrinez pas, reprit cet homme ; votre jambe est solide, j'en réponds.

— Tout cela, dit alors M. le maire, n'empêche pas ce jeune homme de boiter depuis sa naissance : c'est un fait connu de tout Phalsbourg.

— Sans doute, fit aussitôt le médecin de l'hôpital, la jambe gauche est trop courte; c'est un cas d'exemption.

— Oui, reprit M. le maire, je suis sûr que ce garçon-là ne pourrait pas supporter une longue marche; il resterait en route à la deuxième étape.

La premier médecin ne disait plus rien. Je me croyais déjà sauvé de la guerre, quand M. le sous-préfet me demanda :

— Vous êtes bien Joseph Bertha ?—Oui, M. le sous-préfet, répondis-je.

— Eh bien, messieurs, dit-il en sortant une lettre de son porte-feuille, écoutez!

Il se mit à lire cette lettre, dans laquelle on racontait que, six mois avant, j'avais parié d'aller à Saverne et d'en revenir plus vite que Pinacle ; que nous avions fait ce chemin ensemble en moins de trois heures, et que j'avais gagné.

C'était malheureusement vrai! ce queux de Pinacle m'appelait toujours boiteux, et dans ma colère j'avais parié contre lui. Tout le monde le savait, je ne pouvais donc pas soutenir le contraire.

Comme je restais confondu, le premier chirurgien me dit :

— Voilà qui tranche la question; rhabillez-vous.

Et, se tournant vers le secrétaire, il s'écria :

— Bon pour le service

### ORAL EXAMINATION.

Grammatical questions.
Reading.
Conversation.

### *La Fontaine's fables.*

1. La Cigale et la Fourmi.
2. Le Corbeau et le Renard.
3. La Grenouille qui veut se faire aussi grosse que le Bœuf.
4. La Génisse, la Chèvre, et la Brebis en société avec le Lion.
5. Le Loup et l'Agneau.
6. Le Renard et la Cigogne.
7. Le Chêne et le Roseau.

### *Grammar.*

Irregular verbs: Faire, lire, mettre, moudre, naître, plaire, plaindre, prendre, rire uivre, vivre, aller, envoyer, acquérir, bouillir, courir, cueillir, fuir, mourir, &c., &c..

1. Name the relative pronouns.
2. State the use of the relative pronouns *qui* and *que*.
3. When are *lequel, laquelle,* used instead of *qui* and *que?*
4. Define the word "*dont*"; give its meaning and its use.
5. Explain the use of "*ce*" in this sentence: *Il est venu me voir ce qui m'a étonné.*
6. Give the definition of "*on*"; also its meaning and its use.
7. Give the agreement of the past participle in the passive verbs.
8. Is the passive form as much used in French as it is in English? Translate: *We have not been heard. He is called Henry.*
9. Pronominal verbs are subdivided into reflective, reciprocal, accidental, and essen-al. Define each of these classes.
10. Translate: *Flour sells at ten dollars a barrel. The sun rises, sets.* Give the remarks r rules suggested by these examples.
11. Give the meaning of *Venir pour, Venir de, Venir à.*
12. Give the use of *Jouer de* and *Jouer à.*
13. Give the rules about the position of the objective pronouns with a verb in the nperative.
14. Give the use of the conditional mode with examples.
15. Translate: *Could you do that? I might try.* Give the remark suggested by these xamples.
16. Translate: *You ought to do that.* Give the remark suggested by this example.
17. Translate: *He could have done it. He ought to have done it.* Give the remarks eferring to these examples.
18. Translate: *How high is that steeple? That steeple is two hundred feet high.* Give e remarks referring to these examples.
19. Translate: *A room fifteen feet long by twelve wide.* Give remarks referring to this xample.
20. Translate: *You are two inches taller than I. I have a dollar too much.* Give re-arks referring to these examples.
21. Translate: *A dining-room. A steam-engine.* Give the rule.
22. Use "*La plupart*" and "*Bien*" in translating *most men, many people.* Give ule.
23. Give the use, 1st, of the past definite; 2d, of the past anterior.
24. Give the use of the subjunctive.
25. Translate: *The best scholar I ever had.* Give the rule.
26. Give the conjunctions which govern the subjunctive.
27. What is to be remarked about the conjunction *que?*
28. Give the use of the tenses of the subjunctive mode.

# SECOND CLASS.

## DEPARTMENT OF SEAMANSHIP.

### SEAMANSHIP.

ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, four hours.*

1. Describe the different kinds of rope in use in service, and give some of the uses of each. How is wire rope preserved from weather, &c.? Hemp rope? Name the different parts of a block. Explain and give the power gained in each of the following tackles, viz, single whip, whip and runner, luff, gun tackle, and Spanish burton.

2. Draw and describe a foremast; fore-topmast; topgallant and royal masts; bowsprit and jib-boom. State how they are secured, showing how and where each stay, shroud, &c., is set up.

3. Get shears on board over the side and in place, and step mizzen-mast.

4. Topmast being alongside, get it on board; point it and get crosstrees in place.

5. Describe and draw mainsail; main-topsail; jib and spanker; giving all their fittings, including running rigging, and give the usual lead of the latter.

6. Secure yards and hoist out steam-launch.

7. Rig capstan (patent); bring to on chain; reeve cat and fish; explain bitts, compressors, and stoppers.

8. Explain how topgallant-masts are sent aloft and topgallant-yards crossed, giving the orders.

9. Make up a topsail and course for bending, and bend them, giving the orders.

10. Tack ship under all plain sail, fine working breeze.

### NAVAL TACTICS.

ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, three hours.*

1. Name the formations for a fleet? What constitutes an order of battle?

2. Draw diagram of fleet in natural order (line), and indicate the positions of commander-in-chief, division and squadron commanders, and give distances between vessels at open order, half distance, and close order.

3. What should the strength of the reserve division be relatively to the whole fleet? Of what vessels should it be composed, and upon signal being made for it to reinforce the fleet, what is done?

4. Fleet being in column of vessels heading north in natural order, form it into columns of vessels abreast by divisions on any course.

5. Fleet being in columns of vessels abreast by divisions in natural order heading north, change direction to the left on any course from north to west (2 methods).

6. Fleet in line, form it into double echelons from the center of divisions, preserving original direction.

7. Change from columns of vessels abreast by divisions under sail to single columns of vessels on the other tack, with the lee division leading.

8. Fleet being in columns of vessels abreast by divisions by the wind, wind hauls aft; restore the order on the same tack.

## DEPARTMENT OF ORDNANCE AND GUNNERY.

### GUNNERY.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, four hours.*

1. Describe steel 3-inch B. L. R., giving details of bore and screw box, with drawings. No description of plug required.

2. Give a description of a spherical shell from the time it leaves the hands of the inspector till it is ready to put in the gun. Drawings of all parts required. Omit fuze.

3. Describe *in and out gear* and *compressor gear* of XV-inch Monitor carriage, with drawings.

4. Draw and explain in full detail the Navy time-fuze.

5. Draw and describe a shrapnel for 3-inch B. L. R. Omit fuze.

6. Draw and describe in full detail the breech-plug and plug-bracket for 80-pdr. B. L. R.

7. Divide a gun's crew of 16 men and P. B. for casting loose both sides; give titles and arms.

8. Describe the construction and internal arrangements of a magazine and light-box.

9. Give classification and proportions of ingredients of Navy powders. What are the charges and kinds of powder used in the XV-inch M. L. S. B. and 8-inch M. L. R.?

10. A company in column of fours on the march; form to the right into line, on the right into line, and right front into line.

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## DEPARTMENT OF ASTRONOMY AND NAVIGATION.

### ASTRONOMY.

### SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, four hours.*

1. Describe briefly how the error of a mean-time chronometer may be found, using a transit instrument and an astronomical clock. Define axis of collimation, axis of rotation, and line of sight. What three things are necessary in order that the transit instrument may be in adjustment? What is amplitude? What is azimuth?

2. The altitude of a star is measured with a sextant and artificial horizon; the reading of the sextant is 83° 42′; the true altitude (neglecting parallax and refraction) is 42° 15′: what is the index correction? The least count of a vernier is 6″, and the degrees on the arc are divided into twelve equal parts: what number of parts of the vernier and the arc are equal to each other? What is a vertical circle? What is the prime vertical?

3. January 10, 1879 (civil day), longitude 81° 15′ 30″ west, the local sidereal time was $20^h\ 0^m\ 0^s$: what is the local mean time? What is the declination of the sun?

4. What is geocentric, and what heliocentric, parallax? What is the difference between horizontal and annual parallax? What is refraction? For a given altitude, what does its amount depend upon? and how is it affected by fluctuation of the barometer and thermometer? Define dip; how is it affected by refraction? Give the

signs of application of dip, parallax, and refraction to an observed altitude. What is a circle of declination? What is right ascension?

5. Explain the methods of the text of finding the latitude at sea. How is the longitude found by a Greenwich chronometer? by correct lunar distances?

6. March 22, 1879 (astronomical day), longitude 171° 43′ 45″ west, the altitude of ♃ at her meridian passage was 47°: what were the two possible values of the latitude? The corrected establishment being $4^h\ 13^m$, what was the time of the next high water? and at which place was it the higher tide of the given day?

7. What causes the change of seasons? and of what is this cause the result? Why does the ellipticity of the earth's orbit have very little to do with the change of the seasons? What are celestial latitude and longitude?

8. What is the equation of time? Of what two parts is it composed? What year is used in our calendar, and why? Why do we not use sidereal time in ordinary life, instead of mean time? What is a circle of perpetual apparition? What is the upper branch of a meridian?

9. Mention all bodies which have geocentric parallax. What is twilight? How long would twilight last in 60° north latitude, when the sun is on the equinoctial? Define briefly precession and aberration. What is the difference between a parallel of latitude and a circle of latitude?

10. May 6, 1879 (civil day), longitude 151° 43′ 0″ east, the corrected distance of the ☽ from the ✱ *Regulus* was 80°: what were their respective hour-angles, and what was the declination of the ☽?

11. What is the difference between a lunar cycle and a cycle of eclipses? What is the harvest moon? Which kind of eclipse occurs the more frequently, and why? Which occurs more frequently at a given place? What is diurnal libration? What is the ecliptic? the equinoctial? the solstitial colure?

12. What is the cause of the tides? of the daily inequality? What is the corrected establishment of a port? What is flood, and what neap, tide? What is the priming of the tide? How do you know if a certain tide of a given day will be the higher? What is anomaly? a line of apsides?

13. When does the retrograde motion of planets occur? Mention the planets in their order from the sun and in the order of their magnitudes, giving the number of satellites of each. What is departure? hour-angle? the zodiac?

14. October 15, 1879 (astronomical day), the hour-angle of the true sun was $+ 3^h\ 32^m\ 23^s$, the longitude being 68° 43′ 30″ east: what is the local sidereal time? and also the horizontal parallax of the moon at the same instant? How long will it be before the moon's meridian passage?

15. What is a comet? a shooting star? a detonating meteor? an aerolite? How are stars catalogued? What is a binary star? What is the distinction between a cluster and a nebula? What is proper motion? What is the difference between astronomical and civil time? What is the Gregorian calendar?

## DEPARTMENT OF PHYSICS AND CHEMISTRY.

### ELECTRICITY.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, four hours.*

1. Define the specific inductive capacity of a dielectric. How is the speed of signaling through a cable influenced by the inductive capacity of the insulating material?

2. At the Naval Academy, in a locality removed from masses of iron, where the dip is 70° 57′, a magnet made 6.31 vibrations per minute in a horizontal plane; on board the monitor, just abaft the turret, the same magnet made 4.72 vibrations per minute,

he dip being 65° 15′. Compare the horizontal and total intensities of the earth's nagnetic force at the two places.

3. What is the definition of unit current in the electro-magnetic system? What are he units of current resistance and E. M. F. adopted in practice?

4. Describe the commutator of the Farmer's machine. A Farmer's machine is urned with sufficient velocity to produce an E. M. F. of 15 volts; resistance of machine, ohms. The poles are connected by circuits in multiple arc. The first contains two uzes of .45 ohms resistance each, with leading wires of .8 ohms resistance. How nany fuzes may be introduced into the other circuit with leading wires of 1.5 ohms esistance, and all fuzes be fired in both circuits, if it require .75 webers current to gnite a fuze?

5. What causes polarization of a battery, and what reagents are used to prevent it n the Daniell's, Grove's, and LeClanche cells? Describe a Grove's cell and the chemical reactions that take place in it when it is in action.

6. It is wished to explode a submarine mine in which are two fuzes in continuous ircuit, each fuze having a resistance of one ohm at the firing point, the resistance of he leading wires being 18 ohms, and the strength of the current necessary to fire a uze being .8 webers. What is the least number of cells of E. M. F. .98 volts and R 4 hms each that may be employed, and how must they be arranged?

7. If at Dublin, where, in 1875, the absolute intensity of the earth's magnetic force vas 10.42 British units, a wire one metre long, perpendicular to the line of dip, was noved in a direction perpendicular to the line of dip and to itself with a velocity of ne metre per second, what was the value in C. G. S. units of the E. M. F. developed in he wire?

8. If a current from 12 Grove's cells in series is sent through two voltameters in eries, one containing a solution of cupric sulphate and the other a solution of silver itrate, how much silver and how much copper will be deposited while 4 grms. of inc are dissolved in the entire battery? How much deposited if the amount of zinc vere consumed, the battery being joined in 2 groups of 6 cells each, at wt. of $Zn^{11}$ 65; $g^{1}$ 108; $Cu^{11}$ 63.4.

9. How may H (the horizontal intensity) be determined?

10. A galv. whose resistance was 892 ohms was shunted with a shunt which reduced ts sensibility to $\frac{1}{12}$, but, in order to maintain the same strength of C as before in the ircuit, an additional resistance was introduced: how much was it?

# DEPARTMENT OF MECHANICS AND APPLIED MATHEMATICS.

## CALCULUS.

### SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, five hours.*

1. Deduce the differential of $\frac{1}{x}$ in terms of an unknown constant, and determine the onstant.

2. Given $y = \log(x + \sqrt{x^2 - a^2}) + \sec^{-1}\frac{x}{a}$, find $\frac{dy}{dx}$.

2. Given $y = \frac{2}{\sin^2 x \cos x} - \frac{3\cos x}{\sin^2 x} + 3\log\tan\frac{x}{2}$, find $\frac{dy}{dx}$.

3. Find the position of a line passing through the point $(a, b,)$ when the sum of its ntercepts on the co-ordinate axes is a minimum.

3. Determine the semi-vertical angle of the cone of minimum volume described about given sphere.

4. Expand $\frac{\varepsilon^x}{1+x}$ in powers of $x$ to the term containing $x^4$ inclusive.

4. Expand $\log\tan\left(\frac{\pi}{4} + x\right)$ to the term containing $x^3$ inclusive.

5. Find the value of $\left(2-\frac{x}{a}\right)^{\tan\frac{\pi x}{2a}}$ when $x=a$; also the value of $x^{\frac{1}{\log(\epsilon^x+1)}}$ when $x=0$.

6. Find the length of a perpendicular from the origin on the tangent to an ellipse in terms of the semi-axes and the angle ($\beta$) between the perpendicular and the axis of $x$.

6. Find the radius of curvature of the curve $\sqrt{x}+\sqrt{y}=2\sqrt{a}$.

7. Derive the equations of the cycloid and determine the radius of curvature.

8. Determine the value of $\int\frac{dx}{(1+x^2)\sqrt{1-x^2}}$, and of $\int_0^{\frac{\pi}{2}}\cos^{2n}\theta d\theta$;

also prove that $\int_0^{\frac{\pi}{2}}\cos^{2n}\theta d\theta=\int_0^{\frac{\pi}{2}}\sin^{2n}\theta d\theta$.

9. Find the length of the curve $r^{\frac{1}{4}}=a^{\frac{1}{4}}\cos\frac{1}{4}\theta$, the limits being 0 and $2\pi$.

9. Find the area inclosed by one loop of the curve $a^2y^4=x^4(a^2-x^2)$.

10. Prove Simpson's three-eighths rule.

10. Find the volume of a solid cut from a right circular cylinder by a plane passing through the centre of the base and inclined at an angle $\beta$ to the plane of the base.

11. A solid is bounded by six plane surfaces, of which two are parallel rectangles, with the longer side of one parallel to the shorter side of the other; the lengths of their sides are 2 and 5, and 1 and 4, respectively, and the perpendicular distance between them is 144: find the volume of each of the four parts into which the solid is divided by three sections parallel to the rectangular faces, one being the maximum section, one the square section, and the third the section containing the maximum diagonal.

## MECHANICS.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, four hours.*

1. A frigate's quarter-boat is 32 feet long, and weighs, with oars, etc., 2,880 pounds. The centre of gravity is 17 feet from the bow. The falls are hooked 3 feet from the stem and 1 foot from the stern, and are rove through double upper and lower blocks. The davits are formed of a straight piece of length $4\left(2\sqrt{3}-\frac{3}{2}\right)$ feet, and a quadrant of a circle of radius 6 feet, and are stepped in a shoe or saucer with the straight part vertical and passing through a socket, 5 feet above the saucer. The falls lead from the upper block at an angle of 60° with the vertical, and the forward fall belays to a cleat on the davit, while the after fall belays inboard. Neglecting the weight of blocks, alls, and davits, find, in the case of the forward fall—

P, the vertical pressure on the shoe,
Q, the horizontal strain on the shoe,
R, the horizontal strain on the socket,
S, the tension on hauling part of falls,
T the whole tension on the hook of upper block,
$\theta$, the angle made by T with the vertical.

2. Find P, Q, R, S, T, and $\theta$ for the after fall and davit of the above-mentioned boat.

3. Find the centre of gravity of the solid formed by the revolution of the sector of a circle about one of its bounding radii, $a$ denoting the radius of the circle, and $\alpha$ the angle of the sector.

Or—

3. A frustum is cut from a right cone by a plane bisecting the axis; show that it will rest in equilibrium with its slant height on a horizontal table, if the height of the cone bears to the diameter of its base a greater ratio than $\sqrt{7}$ to $\sqrt{17}$.

4. The space described by a falling body in the 5th second of its fall was one-sixth f that described in the last second but four; what was the whole space described?

4. Deduce the equation to the path of a projectile in a non-resisting medium.

5. A shot is projected from the top of a tower whose altitude is $h$, with a velocity ue to the height $nh$; find the maximum range on the horizontal plane through the bot of the tower, and the corresponding angle of projection.

Or—

5. Find the time of a small vibration of a right square pyramid about an axis hrough its vertex parallel to one of the sides of the base.

6. Compare the times of emptying two equal hemispheres filled with fluid, through qual orifices, one in the vertex, the other in the base.

6. If a diving bell 10 feet in height, in the form of a paraboloid of revolution. be sunk n water until the surface in the bell rises 5 feet, determine the distance of the top of he bell from the surface of the water, the height of the water barometer being 33 feet.

*Extra question.*

Find the centre of the pressure on the area of an immersed cycloid, the base being n the surface of the fluid.

Find the centre of the pressure on the area inclosed by one loop of the lemniscata $r^2 = a^2 \cos 2\theta$), the initial line being vertical, and the pole in the surface of the fluid.

## DIFFERENTIAL AND INTEGRAL CALCULUS.

### SEMI-ANNUAL EXAMINATION.

### ELECTIVE COURSE.

JANUARY, 1879.—*Time allowed, five hours.*

*Cadet-Midshipmen P. R. Alger, L. S. Norton, J. B. Bernadou, H. G. Dresel, H. Phelps, A. A. Ackerman, and G. E. West.*

*Cadet-Engineers W. F. Durand, A. W. Stahl, L. D. Miner, W. F. C. Hasson, W. S. Sample, and W. H. Allderdice.*

1. Expand in ascending powers of $x$ the functions $\frac{\sin 3x}{\sin x \sin 2x}$ to the term containing $x^5$, and $(1+x)^{\frac{1}{x}}$ to the term containing $x^3$.

2. Evaluate the expression $\left[(1+x)^{\frac{1}{x}} \cot^2 x - \frac{\log (1+x)^{\frac{\epsilon}{x}}}{\tan^2 x}\right]_0$.

2. Prove that the evolute of the epicycloid

$$x = \frac{a}{2}(3\cos\psi - \cos 3\psi), \qquad y = \frac{a}{2}(3\sin\psi - \sin 3\psi)$$

is a similar epicycloid.

3. Evaluate $\int_0^1 \frac{\log x\, dx}{1+x}$ and $\int_0^\pi \frac{x \sin x\, dx}{1+\cos^2 x}$.

4. If $u = \int_a^b \phi(x, c)\, dx$, prove that $\frac{du}{dc} = \int_a^b \frac{d\,\phi(x, c)}{dc}\, dx$.

4. Evaluate $\int_0^{\frac{\pi}{2}} \frac{dx}{1+\cos\theta\cos x}$.

5. Given $\int_0^\infty \frac{x^{2m}\, dx}{1+x^{2n}} = \frac{\pi}{2n} \operatorname{cosec} \frac{2m+}{2n}\pi$, derive $\int_0^1 \frac{x^n + x^{-n}}{x + x^{-1}} \cdot \frac{dx}{x} = \frac{\pi}{2} \sec \frac{n\pi}{2}$.

5. Determine the value of $\int_0^1 \frac{(z^a + z^{-a} - 2)\, dz}{(1-z)\log z}$.

6. Determine the value of $\int_0^\infty \varepsilon^{-x^2}\,dx$, and from the result derive the formula $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$

7. Find the whole area inclosed by the curve $\left(\frac{x}{a}\right)^5+\left(\frac{y}{a}\right)^{\frac{7}{2}}=1$.

7. Find by means of gamma-functions the area of one loop of the curve, $r^{\frac{1}{3}}=a^{\frac{1}{3}}\cos\frac{1}{3}\theta$.

8. Find an expression in gamma-functions for the length of one loop of the curve $r^m=a^m\cos m\theta$.

8. Find the length of the curve $x=6\sin\psi-2\sin^3\psi$ and $y=2\cos^3\psi$, the limits being $\psi=0$ and $\psi=\pi$.

9. Find the volume common to the sphere $r=\frac{a}{2}$ and the solid formed by the revolution about the initial line, of the curve $r=a(1+\cos\theta)$.

9. Find the area between the asymptote and the curve in the case of the folium of Descartes. Find also the area inclosed by the loop.

10. Derive the rectangular equation of the loxodromic curve, and determine its length.

## ELECTIVE MECHANICS.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, four hours.*

*Cadet-Midshipmen P. R. Alger, J. B. Bernadou, H. G. Dresel, L. S. Norton, H. Phelps, A. A. Ackerman, and G. E. West.*

*Cadet-Engineers W. F. Durand, W. F. C. Hasson, A. W. Stahl, L. D. Miner, and W. S. Sample.*

1. A particle is describing a curve; find its accelerations along and perpendicular to the tangent at any instant. Determine also the accelerations along and perpendicular to the radius vector.

2. A boat starting from a given point A on the bank of a river is propelled with a constant velocity $u$ and is constantly directed toward a point Q on the opposite bank; the points A and Q being in the same line perpendicular to the direction of the current, and $v$ denoting the velocity of the current, find the equation of the path.

2. A particle projected with a velocity $u$ is acted on by a force which produces a constant acceleration $f$ inclined at a constant angle $\alpha$ to the direction of the motion; find the intrinsic equation of the path described.

3. A particle moves in a straight line under the action of an attraction which varies inversely as four-thirds power of the distance from a fixed point in that line; determine the time of an oscillation when the particle starts at the distance $a$ from the fixed point, with the velocity due to a fall from infinity. Find also the time when the attraction varies as the first power of the distance.

4. Determine the polar equation of the path described by a particle acted on by a central attraction, and prove that the sectorial area described by the radius-vector is proportional to the time.

5. Find the law of the central attraction in order that a particle may describe a lemniscata, the centre being at the node. Determine the equations of the paths described by particles when the central attraction varies inversely as the cube of the distance.

6. A projectile moves in a resisting medium; determine the values of $x$, $y$, and $t$, when the resistance is proportional to the cube of the velocity. Also determine approximately the equation of the path described when the resistance is proportional to the square of the velocity.

## DEPARTMENT OF MODERN LANGUAGES.

### SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, two and a half hours.*

*Translate into French:*

### THE ROYAL OAK.

Charles II, son of the unfortunate Charles I, king of England, whom the English Parliament, under the usurper Cromwell, put to death upon the scaffold, endeavored several times to conquer the throne of his ancestors, but, after losing many battles, his troops were entirely defeated at Worcester. The adventures of the unhappy prince after that battle are curious. After having run the greatest dangers, he found an asylum and friends at the house of four brothers, husbandmen of the name of Penderell. There, the better to disguise him, they stained his hands and cut his hair, gave him the dress of a wood-cutter, and put an axe in his hand. Thus disguised they led him into the woods. During some days the king had for his bed nothing but some straw under the trees. The soldiers of the Parliament often came there to seek for him, and the king, in order to avoid them, was obliged to climb up an oak, whence he saw pass at his feet the people who were seeking him. This venerated oak received at the restoration the name of the Royal Oak, and till about the middle of the eighteenth century one might see at the fruiterers' in London, on the 29th of May, the anniversary of the preservation of the king, gilded oak leaves. Some persons even wore them in their button-holes on that day.

1. Parse the phrase, "The adventures of the unhappy prince after that battle are curious."
2. Give in a table (*a*) the present indicative, 1st person singular and plural: (*b*) the imperative, 2d person singular; (*c*) the present subjunctive, 3d person singular and plural; (*d*) the future, 1st and 2d person singular, of aller, arriver, venir, pouvoir.
3. Give the feminine of the adjectives petit, grand, jeune, ancien, gros, beau, and vieux.
4. State the rule of the past participle, when conjugated with avoir. Give two instances.

*Translate into English:*

J'ai raconté jusqu'à présent les grandes choses de la guerre, des batailles glorieuses pour la France, malgré nos fautes et nos malheurs. Quand on a combattu seul contre tous les peuples de l'Europe,—toujours un contre deux et quelquefois contre trois,—et qu'on a fini par succomber, non sous le courage des autres, ni sous leur génie, mais sous la trahison et le nombre, on aurait tort de rougir d'une pareille défaite, et les vainqueurs auraient encore plus tort d'en être fiers. Ce n'est pas le nombre qui fait la grandeur d'un peuple ni d'une armée, c'est sa vertu. Je pense cela dans la sincérité de mon âme, et je crois que les hommes de cœur, les hommes sensés de tous les pays du monde penseront comme moi.

Mais il faut maintenant que je raconte les misères de la retraite, et voilà ce qui me paraît le plus pénible.

On dit que la confiance donne la force, et c'est vrai surtout pour les Français. Tant qu'ils marchent en avant, tant qu'ils espèrent la victoire, ils sont unis comme les doigts de la main, la volonté des chefs est la loi de tous; ils sentent qu'on ne peut réussir que par la discipline. Mais aussitôt qu'ils sont forcés de reculer, chacun n'a plus de confiance qu'en soi-même, et l'on ne connaît plus le commandement. Alors ces hommes si fiers,—ces hommes qui s'avançaient gaiment à l'ennemi pour combattre,—s'en vont les uns à droite, les autres à gauche, tantôt seuls, tantôt en troupeaux. Et ceux qui tremblaient à leur approche s'enhardissent; ils s'avancent d'abord avec crainte, ensuite, voyant qu'il ne leur arrive rien, ils deviennent insolents, ils fondent sur les traînards à trois ou quatre pour les enlever, comme on voit les corbeaux, en hiver, tomber sur un pauvre cheval abattu, qu'ils n'auraient pas osé regarder d'une demi-lieue lorsqu'il marchait encore.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, two and a half hours.*

*Translation from English into French.*

### MUCIUS SCÆVOLA.

If we may believe the story, when Porsenna, king of Etruria, had besieged Rome to reinstate Tarquin in his rights, Mucius determined to deliver his country from so dangerous an enemy. He disguised himself in the habit of a Tuscan, and, as he could speak their language fluently, he gained an easy introduction into the camp, and soon into the royal tent. Porsenna sat alone with his secretary when Mucius entered. The Roman immediately rushed upon the secretary and stabbed him to the heart, mistaking him for his royal master. Mucius, unable to escape, was seized. He gave no answers to the inquiries of the courtiers, and only told them that he was a Roman; and, to give them a proof of his fortitude, he laid his right hand on an altar of burning coals, sternly looking at the king, and without uttering a groan, boldly told him that three hundred young Romans like himself had conspired against his life, and determined either to destroy him or to perish in the attempt. This extraordinary confession astonished Porsenna, who made peace with the Romans and retired from the city. Mucius obtained the surname of Scævola, the left-handed, because he lost the use of his right hand by burning it in the presence of the Etrurian king.

*Traduisez le morceau suivant en Anglais.*

### LA MÈRE DE WASHINGTON.

A l'epoque où Washington fut nommé commandant en chef des armées américaines, et peu de temps avant qu'il allât rejoindre les troupes à Cambridge, la mère de ce héros quitta sa maison de campagne pour s'établir au village de Frédéricksburg, situé moins loin du théâtre de la guerre; elle y resta durant presque toute la lutte révolutionnaire, placée sur la ligne des postes: tantôt c'était un courrier qui passait, apportant la nouvelle d'une victoire, et tantôt c'était un messager de malheur, annonçant les désastres d'une défaite: mais la fortune favorable ou contraire ne put altérer le calme de son âme. Mettant toute sa confiance en Dieu, elle montra à ses concitoyens que leurs fils combattaient pour les droits de l'homme, pour la liberté et pour le bonheur des siècles futurs.

A la nouvelle de ce glorieux passage de la Delaware qui vint relever les espérances abattues des Américains, plusieurs des amis de Mrs. Washington se réunirent chez elle pour la féliciter. Elle les reçut avec dignité, disant que l'événement était fort heureux: que George paraissait avoir bien mérité de la patrie; et, comme les patriotes ne cessaient de louer la conduite du général: Mes bons messieurs, répondit-elle, ceci est de la flatterie . . . . mais mon George n'oubliera jamais les leçons que je lui ai données; i ne s'oubliera pas lui-même en dépit de tant d'éloges.

Lorsque Mrs. Washington fut informée de la prise de Cornwallis, elle s'écria, en élevant les yeux au ciel: Dieu soit loué, la guerre est terminée; la paix, l'indépendance et le bonheur vont habiter notre patrie!

# FIRST CLASS.

## DEPARTMENT OF SEAMANSHIP.

### PRACTICAL SEAMANSHIP.

ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, three hours.*

1. Describe the watch, quarter, and station bills of a sloop of war, and state the inormation given by them. Name the different station bills.

2. Make preparations for sea in all respects, and station officers and men for getting hip underway under sail.

3. Riding to a coast current by starboard anchor, wind four points on starboard bow, hore close aboard on port-beam, weigh and stand out, using no spring.

4. Wear ship short round.

5. Weather main topsail sheet and clewline carried away; what to do?

6. Ship under all plain sail and starboard stun'sails, struck by a squall; what to do?

7. Supposing yourself in a cyclone, south latitude, ship hove to, wind S. E., then S.; how would you proceed? What are the indications of a cyclone?

8. Where does a surf break heaviest on a flat beach, and where is the greatest danger? Land a boat through such a surf.

9. What are the boat salutes (under oars, sails, and laden) for all officers?

10. Two sailing vessels crossing, wind N. E., one heading E. S. E., the other N. W.; which has the right of way? Two steamers crossing, which has the right of way? Give different fog signals and rules regarding lights.

### SHIP BUILDING.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, four hours.*

WOODEN SHIP BUILDING.

1. How do you locate and prepare a building-slip? Describe all the preparations to be made before laying the keel of a ship. What rates of inclination must be attended to? how regulate the blocks, &c.? Describe a keel. What is it made of? how made? how fastened to stem and stern posts? What is a *room and space batten* and its use?

2. What are the frames of a ship? how divided? what timbers are they composed of? How are the timbers put together? Describe method of raising and regulating frames. How and when is a ship regulated? What are the filling timbers, their use, and advantages, if any? What is the *cutting-down* or *throating line?*

3. Make sketch of transverse section at ⊕. Describe manner of diagonal bracing. How are the sides of a ship united forward, aft, and amidships? Give detail of the fastenings. Define bilge strakes, thick strakes, and shear strakes. Name the different keelsons.

4. What preparations are necessary before commencing to plank a ship? Give method of planking. Define garboard strake, and state how it is fastened. What are ribbands, harpins, and sirmarks?

5. Upon what does the transverse strength of a ship depend? Give plan of deck-framing of a ship, showing all the timbers, &c. Define *spirketing.*

6. How many different kind of rudders are there? Describe each kind, how made, and arrangement connecting them to ships. How are boats distinguished in the manner of building? Describe each kind.

7. How many kind of docks are there? Name them; give a general description of each, and method of docking a vessel in each. Describe a marine railway.

8. Detail preparation necessary for launching a ship. How do you determine the breadth of the ways? What distance between ways? What are poppets? In case ship stops on the ways when partly launched, what is to be done?

### IRON SHIP BUILDING.

*Time allowed, four hours.*

1. Name the different forms of keels in common use, and describe keel of an iron-clad ship. Describe the stem of an iron-clad, the manner of scarfing and uniting the pieces, joining to the keel, &c. Describe stern posts of iron-clad, with and without lifting propellers.

2. How many parts in a frame of an iron ship built on the transverse system? Name the parts and state how they are fitted together. How are the keelsons worked? When are double-reverse angle-irons fitted?

3. Define the longitudinal system, and state what advantages it has over the transverse system. Give longitudinal system of Mr. Scott Russell.

4. Describe the bracket system, and state what are its advantages, if any. Explain manner of dividing the double bottom into water-tight cells. What is the armor-shelf, and how formed? Give one of the modes of building bracket framing.

5. What are the principal varieties of beams in use at the present time? Give sketches showing how they are constructed. Give rules for sizes of beams. How are beams spaced in war vessels? Describe beam arms most used, and manner of bending beams.

6. Describe the different systems of plating, and make a sketch of the one now in use, showing the arrangement of butts, rivets, &c. Give illustration of stem-plate. Explain manner of using it. How are sizes of rivets regulated, and give rules for spacing them.

7. How are water-tight bulkheads fitted? Illustrate manner of securing them to ship's side. What bulkheads are there on board ship that, besides being essential for storage, are considered structurally? What are the plates, and how can they be made to do the most service?

8. What are sheathed ships? State the object of this system of construction. Give the different methods and illustrate the best. What are composite ships? Give general features of the system, and state what class of vessels are built on this plan.

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## DEPARTMENT OF ORDNANCE AND GUNNERY.

### ORDNANCE AND ARMOR.

#### SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, five hours.*

1. State the differing conditions in which iron exists in cast iron, wrought iron, and steel; also in general terms the nature of the processes by which it is made to pass from one to the other, and reciprocally.

2. Name the properties which distinguish iron in each of these three conditions, and contrast them with one another with reference to suitability for making guns.

3. Discuss the difficulties in the way of making heavy homogeneous guns of, 1st, cast on; 2d, wrought iron; 3d, steel; and, granting such a homogeneous gun to exist, the ason why its full strength cannot be developed to resist the force of the discharge.

4. State and discuss the general principles upon which built-up guns are made; also e nature of the strains to be resisted, and the practical effect of this last considera- n upon the construction of the gun.

5. Define bronze. State the difficulties in the way of producing a perfect mixture ingredients, and how the results of this difficulty are seen in the cast gun. How is e Uchatius gun made?

6. Describe the manufacture of the Parrott gun, and the system of Palliser's con- ersion.

7. What is the object of hollow-casting guns? Having your stock of pig iron, name e different processes in the making of a hollow-cast XV-inch gun, stating the nature d object of each step, but avoiding details of the operation.

8. Describe in full detail the French system of breech-loading.

9. Describe the Siemens-Martens process of producing steel.

10. Describe the effect of rapid and slow cooling upon cast iron and steel; and the actical use made of these qualities in the case of steel.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, five hours.*

1. State the general properties, mode of preparation and uses of gun-cotton.

2. Describe the Schenkle and German percussion fuses (drawings).

3. Describe the effect of varying the size of grains and density upon the action of ed gunpowder.

4. What is the object of rifling? Advantages of elongated over spherical projectiles?

5. Describe the systems of rifling in use in the U. S. Naval Service, and state the ad- antages and disadvantages of the systems.

6. Describe the arrangement for giving compression in the central compressor car- age (drawings).

7. Describe the howitzer boat carriage (drawings).

8. Upon what consideration does the effect produced by a projectile depend? In nsidering this question, the effects produced by a shell exploding when imbedded in target need not be discussed nor the character of any target other than may be fered by a ship.

9. Describe the working of the Boulengé chronograph; state the object of the dis- nctor. What is meant by the disjunctor-reading, and to what times does that read g correspond?

10. How is a battalion to be handled when moving up to and attempting to carry by sault an enemy's position?

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## DEPARTMENT OF STEAM-ENGINEERING.

### MARINE ENGINES.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, five hours.*

1. Required, the mean effective pressure in an engine, having given the diameter of iston, 40 ins.; stroke, 4 ft.; clearance, $\frac{1}{9}$ of space displaced by piston; steam cut-off $\frac{1}{6}$ of stroke from commencement; steam pressure, 55 lbs. per sq. in. per gauge; acuum, 26 ins., the barometer standing at 30. Required, also, the relative quantity

of fuel expended in this case, to that required when following full stroke with the mean pressure found. Temp. and relative volume of the steam when cutting off 302.8° F. and 381° respectively; and when following full-stroke 270° and 614° respectively. Consider the weight of a cubic foot of fresh water 62.5 lbs.

2. Sketch and describe the single and double poppet valve, and state the advantages of the latter over the former.

3. Given a pair of engines, total area of piston 2,000 sq. inches; stroke 3 ft.; clearance, 5 per ct. of space displaced by piston; steam pressure 40 lbs. per sq. in. absolute; cut-off at $\frac{3}{4}$ of stroke from commencement; revolutions 60 per minute; relative volume of steam and water at initial pressure 640; temp. 267° F.; coal consumed per hour 1,900 pounds; percentage of loss by blowing off 14.3. Required, the number of pounds of water evaporated per hour per pound of coal.

4. Temp. of water in boiler 300° F.; temp. of feed-water 50° F.; density of feed-water $\frac{7}{8}$; density maintained in boiler 2. Required, the gain in fuel by utilizing heat from the exhaust steam sufficient to raise the temperature of the feed-water to 150° F.

5. A ship is making 11 knots per hour, the screw propeller making 55 revolutions per minute, and having a pitch of 22 feet. Required, the slip in per cent. of the speed of the propeller, a knot being taken at 6,082 feet. Define negative slip.

6. Sketch and describe the Bourdon steam-gauge, Lane's improvement, and the "Manometer" steam-gauge.

7. Given 1 lb. of coal containing 92 per ct. carbon, 6 per ct. hydrogen, and 2 per ct. ash; to find the maximum temperature of furnace when burned with 18 and 24 lbs. of air. Sp. heats $H_2O$, 475; CO, 217; O, 218; N, 245.

8. Given 1 lb. of free hydrogen contained in a quantity of solid fuel, burnt with an excess of 50 % of air above that necessary for perfect combustion; the combustion of 1 lb. of hydrogen liberates 50,000 units of heat. Required, the heat available for the generation of steam, the air entering at 60° F., and the products of combustion escaping at 600° F.

9. Deduce the formula for the distance $S$ traveled by the piston of a steam-engine while the crank turns through an angle $\beta$; angularity of connecting-rod not considered.

10. Deduce the formula for the thickness of cylindrical boilers, and solve the following problem: Unbalanced internal pressure 100 lbs. per sq. in.; diameter 10 ft.; value of metal in boiler-plate 56,000; joints double riveted; factor of safety 8. Required, the thickness of metal.

## DEPARTMENT OF ASTRONOMY AND NAVIGATION.

### NAVIGATION.

### SEMI-ANNUAL EXAMINATIONS.

JANUARY, 1879.—*Time allowed, five hours.*

1. Describe the methods of performing the various operations incident to a day's work at sea, from taking the data from the log to finding the course and distance made good and the current.

2. Deduce (by Napier's rules) formulas for finding the distance and course between two points by great-circle sailing; also the formulas for finding the latitude and longitude of the vertex.

3. How is a great-circle route laid down upon a chart? (no formulas required) What advantages does a knowledge of this route give?

4. Deduce the formulas for the dip of the horizon (with and without refraction) Radius of reflected ray = 7 R.

5. How is the horizontal parallax of the moon obtained? How is the parallax in

ltitude obtained? How will you find the apparent semi-diameter of a heavenly body s seen from the surface of the earth?

6. Give one method complete (with the reasons therefor) for the conversion of local ean time.

7. Deduce (by Napier's rules) the formulæ for finding $h$ and $z$ of a heavenly body at given place and time.

8. Discuss 7 when $d = o$; when $t = 6$ hours.

9. Deduce the formula for the hour angle of a heavenly body when on or nearest to he prime vertical. Under what circumstances would it be desirable to know this our angle? Deduce the formula for the hour angle of a heavenly body when in the orizon. How will you ascertain the time of actual sunset (disappearance of sun's pper limb below the horizon)?

10. Deduce (by Napier's rules) the formulæ for finding the latitude by an altitude at ny time. When will this method be useful at sea?

11. What are $\phi$, $\phi'$, and $\phi''$ respectively? How is each marked, and why?

12. Deduce the formula for finding the latitude by an altitude very near noon. ow is the $t$ of this formula obtained? How is the formula used practically?

13. Deduce the equation of equal altitudes. State what quantities are involved in he equation for $\Delta T_0$, and how they are obtained.

14. Apply 13 to finding the chronometer correction, giving each step in detail with he reasons therefor.

15. In the direct method of lunar distances draw the figure, name the various parts f the triangles considered, and state why the projections of $D$ and $D'$ intersect. Of hat advantage are lunars, and for what purpose are they chiefly used?

16. Define circles of equal altitude. (Give a diagram.) How may the position of he centre of these circles be plotted upon the chart? What is a line of position?

17. How will you find the latitude and longitude of a vessel by Sumner's method, he vessel not being stationary?

18. What determines the angle between the lines of position? What would be the ost favorable conditions that could be selected for determining the position of a ship t sea?

19. How are chronometers wound and compared? What is the object of this comarison? What is meant by second differences in this connection? What do you nsider to be the best method for obtaining the error and rate of a chronometer with e usual appliances furnished to sea-going vessels? Give your reasons for the selecon of this method.

20. By observation at 9.45 a.m. the longitude at noon was 79° 21′ east; by observaon at 3.45 p.m. the longitude at noon was 78° 54′ east; what longitude will you ssume to be the true longitude at meridian?

*Extra questions.*

No credit will be given for these unless all the regular questions are attempted.

1. Deduce the formulæ for the meridional parts of the spheroid, given—

$$r = \frac{a \cos L}{(1 - e^2 \sin^2 \sqrt{L})^{\frac{1}{2}}} \text{ and } R = \frac{a(1 - e^2)}{(1 - e^2 \sin^2 \sqrt{L})^{\frac{3}{2}}}.$$

2. Deduce the formulæ for finding the longitude by Littrow's method.

3. Deduce the formulæ for finding the longitude by equal altitudes at sea. State how e observations are taken, and how the operations are performed.

4. Deduce the formulæ for finding the latitude by two altitudes of the same body, e declination remaining unchanged and the Greenwich time being approximately nown.

5. Deduce Bradley's formula for finding the refraction of a star.

### ANNUAL EXAMINATION.

JUNE, 1878.—*Time allowed, four hours.*

1. Define variation and deviation. When are they named easterly and when westerly? Having a deviation table and the variation from the chart, how will you obtain the course to be steered by compass to make a given true course? Variation, 27° easterly; ☉'s true bearing, S. 70° W.; observed bearing, S. 40° W.; what is the deviation? Variation, 27° westerly; deviation, 16° easterly; true course, NE.; what is the compass course?

2. What are the different methods of ascertaining on each of the 32 points of the compass? Give the details of each. State which you would prefer in practice, and give the reasons for this preference.

3. How is a Napier's curve constructed and how is it used? How is a compass compensated? Using the *Warrior's* deviation table, solve the following: True course, W. $\frac{1}{2}$ N.; variation, 16° easterly; what is the compass course? True course, SE.; variation, 21° westerly; what is the compass course? Compass course, S. $\frac{1}{2}$ E.; variation, 7° westerly; what is the true course?

4. What are the causes of the deviation of the compass in an iron vessel? Having given the deviation on the eight principal points, how will you construct a deviation table by the method of coefficients? What causes the heeling error in an iron vessel? How may it be corrected? Will this correction be permanent, and why? On what courses will the heeling error be the greatest, and why?

5. In the general equation

$$\delta = A + B \sin \zeta + C \cos \zeta + D \sin 2\zeta + E \cos 2\zeta,$$

what are A, B, C, D, and E, respectively? Which are the changing and which the permanent coefficients, and why are they so? How may you ascertain at sea if the deviation is changing? Using same deviation table as in 3, solve the following: The heeling coefficient being $1\frac{1}{4}$°, how must a ship head to make NE. true when she heels 8° to starboard, the variation being 20° westerly?

6. Having just received a theodolite (previous history unknown), how will you proceed to examine its adjustments?

7. Describe the various methods of running in a shore line or wharf. In plotting the work of a survey, how is the base-line laid down? How are the positions of the various stations determined? Give the details of the work.

8. How are lines of soundings run? How are the positions of soundings fixed upon the chart? To what plane are all soundings reduced? How is this done? What is a bench-mark, and its use?

9. Describe briefly the method of making a running survey. (Give a diagram.) What is the final base-line? How is the work plotted when the positions by triangulation and astronomical observations do not agree?

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## DEPARTMENT OF PHYSICS AND CHEMISTRY.

### HEAT AND LIGHT.

### SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, five hours.*

1. What reason is there to believe that a well-constructed air thermometer is more accurate than a mercurial one?

2. The coefficient of linear dilation of platinum for 1° C. is .0000088; of brass is .0000187. The standard temperature for platinum scale is 0° C.; for brass scale is 62° Fah. One meter equals 39.37079 inches. What will be the length of the yard on the platinum scale when both are at 24° C.?

3. Give the physical explanation of a freezing mixture. What is the ordinary peration of an ice machine?

4. Describe in detail Pictet's method of liquefying the so-called permanent gases.

5. A Dumas' flask contains, at 20° C. and 750 mm. pressure, 500 cm.$^3$ of dry air and eighs with its contents 10 grms. Filled with a vapor at 40° and 740 mm. it weighs .2 grms. The coefficient of cubical expansion of glass is .00003. Required, the ensity of this vapor.

6. Define conductivity. Deduce Forbes' expression for the conductivity of metallic ars and describe Forbes' method.

7. To what classes of errors is one liable in physical research? How may they be iminated? Describe the method of graphical representation of the results of experi-ent. What are formulas of interpolation?

8. What is meant by the *quality* of heat rays? What is light equilibrium of surfaces?

9. A balloon whose capacity is 120 cubic meters is filled with hydrogen; weight of alloon and basket, 50 kilos.; Barom. 755 mm.; temp. 18° C.; dew-point, 7°; max. ressure of aq. vapor at 7°, 7.5 mm. Weight of liter of hydrogen at 0° and 760 mm. 895 grms. What is the strain on a rope that binds the balloon to the ground?

10. Describe the cycle of operations of the theoretical engine of infinitesimal range. everse the cycle. Give the area that is the mechanical equivalent of *Mdv*.

11. Deduce Canot's Function and the scale of absolute temp. Prove that there can e no lower temp. than the zero of this scale.

## EPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

### INTERNATIONAL LAW.

ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, five hours.*

I. When does the state acquire title to a prize taken at sea? When may the title ass to individuals? What is the effect of this fact in the case of subsequent recap-ure of the prize? What is the general rule as to the place, and national authority of prize court?

II. What is the rule of international law, and what is the practice, with regard to he persons and private property of enemies found in the country on the breaking ut of a war? in regard to private debts? to public debts?

III. Name the ship's papers required by both municipal and international law, and hose required by international law alone. What is a register? a charter party? a ill of lading?

IV. State the principal arguments for and against the destruction of private prop-rty at sea, as distinguished from private property on land.

V. Explain the terms exterritoriality, doctrine of continuous voyages, rule of *uti ossidetis*, right of postliminy, municipal law, civil law, domicile.

VI. What is the effect of war on intercourse between the subjects of belligerents? on artnerships entered into before the war? How is the question of partnerships affected y the fact that one partner is neutral? How may these rules be modified by licenses o trade?

VII. When does a blockade cease? What is the penalty for a breach of blockade, s to ship and cargo, and how long should the liability continue? At the beginning f a blockade, how are neutral vessels loading in enemies' ports affected?

VIII. How far is the carrying of persons or papers forbidden to a neutral in time of ar? What is the penalty for carrying contraband? What circumstances may be onsidered in determining the contraband character of articles of doubtful quality?

IX. Civil war in United States. Efficient blockade of Southern ports.

(*a*) In command of the United States steamship Supply, you search the English schooner Stephen Hart, off the coast of Florida, and find that she is laden with arms and munitions of war. Her master states that her destination is Cardenas; she has no manifest or invoice. What will you do and what will be the result?

(*b*) Later, you search English schooner Argonaut, off Hatteras Inlet, bound from Nova Scotia to Key West, but attempting to enter the inlet. The master claims that he is short of water, and has no oil for his lamps. Discuss.

X. (*a*) War breaks out between the United States and Great Britain. In command of the United States steamship Peacock, cruising in the northeast trades, you search a North German vessel from Bremerhaven for St. Thomas, with an assorted cargo. You find sundry cases of merchandise, belonging to English firms, transhipped through agents in Bremen. What will you do? Justify your action.

(*b*) Later, you meet a French bark from Havre for Valparaiso, with a cargo of war material consigned to the Chilian Government. What will you do?

## DEPARTMENT OF MODERN LANGUAGES.

### ANNUAL EXAMINATION.

*Time allowed, two hours and a half.*

*Translate into Spanish:*

### MADRID ET SES ENVIRONS.

Madrid est situé sur quelques collines basses, dont le sable est grossier et terreux. Les rues de Madrid sont aussi bien et mieux coupées que celles d'aucune autre ville de l'Europe. On compte à Madrid neuf ou dix mille maisons, dont une quantité sont grandes et spacieuses. Ces maisons sont en granit, en briques, en bois et en cailloux. En général, les façades de ces maisons sont peintes. Si l'on veut connaître les productions rares qui existent à Madrid dans les trois arts libéraux, on peut consulter la description savante de cette ville qu'a faîte don Antonio Ponz à l'appréciation duquel je m'en suis rapporté dans différentes occasions.

Les vents du nord règnent a Madrid pendant l'hiver, et ils y sont très-froids, très-secs et très-pénétrants. Ceux de l'ouest et ceux du sud, au contraire, y sont chauds et pluvieux. Madrid est presque situé au centre de l'Espagne; il est très-élevé relativement à la mer, car on descend continuellement depuis Madrid jusqu'à la Mediterranée, et les eaux des ruisseaux et des rivières de ses environs vont se joindre au Tage, pou se perdre ensuite dans l'Océan. Les montagnes de Guadarrama, avec leurs coteaux sont les seules qu'on voie de Madrid. Le sommet en est couvert de neige pendant plusieurs mois de l'année. Les grandes rues de Madrid sont pavées en silex taillé, le autres le sont en cailloux arrondis qu'on trouve dans les environs. Il y a à Madri beaucoup de fontaines publiques, dont l'eau est très-bonne, et divers marchés.

*Translate into French:*

Los Egipcios son los primeros que han conocido las reglas del gobierno. Aquell nacion grave y seria, pronto conoció la verdadera mira de la politica, que consiste e hacer la vida suave y los pueblos felices. La temperatura de su patria siempre uniforme producia caractéres firmes y constantes. Como la virtua es el cimiento de toda las asociacones, la cultivaron con esmero. La gloria que les han dado de ser los ma reconocidos de todos los hombres, muestra que eran tambien los mas sociables, pues la buenas obras son el vínculo de la concordia pública é individual. Sus leyes eran simples, justas, y proprias para unir los ciudadanos entre sí. El que pudiendo salvar un hombre acometido, no lo hacia, era castigado con la muerte tan rigorosament omo el asesino. Asi los ciudadanos estaban bajo la proteccion unos de otros, y todo l cuerpo del estado estaba unido contra los malos. Entre los Egipcios no era tampoco ermitido ser inútil al Estado.

## DEPARTMENT OF MECHANICS AND APPLIED MATHEMATICS.

### THEORETICAL NAVAL ARCHITECTURE (ELECTIVE).

ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, three hours.*

*Cadet-Midshipmen A. B. Clements, J. Hood, R. H. Miner, E. E. Hayden, H. S. Chase. J. McC. Moore, H. Wike.*

*Cadet-Engineers R. Gatewood, F. T. Bowles, C. B. Lubbe, W. M. McFarland, B. C. Bryan, . A. Carr, A. M. Hunt, E. O'C. Acker, H. K. Ivers, R. T. Isbester.*

1. Derive by the method of finite differences the formula

$$u_x = u_0 + x\Delta u_0 + \frac{x(x-1)}{1.2}\Delta^2 u_0 + \frac{x(x-1)(x-2)}{1.2.3}\Delta^3 u_0 + \dots,$$

nd thence derive Simpson's one-third rule.

2. Derive Weddle's rule for quadratures, and Woolley's rule for volumes.

3.* Find the height of the metacentre above the centre of buoyancy in the case of ship constructed on the wave-line principle, with no middle body; the length of he entrance being $l$, and that of the run $l_1$, $c$ denoting the depth and $b$ the greatest alf breadth, the mid-ship section being a semi-ellipse.

3.† Determine the metacentre of a ship whose water-lines are trochoids aft and nusoids forward, and whose mid-ship section is a semi-ellipse, $l$ and $l'$ being conants; determine also the centre of gravity of the after-body.

4. Find the angle of maximum effect of a ship's rudder; ($\alpha$), when the available ower for turning the rudder is unlimited; ($\beta$), when the power is limited.

5.† Derive the formula for determining the height of the metacentre of any ship bove the centre of buoyancy. Derive the formula for computing the augmented rface, and show how this formula may be employed in determining the probable peed of a ship.

5.* Explain the theory of the wave-line system of construction, and deduce the uations to the water-lines of the fore-bodies and of the after-bodies. Also menon and describe some other curves that are used for the water-lines of ships.

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* For Cadet-Engineers.

† For Cadet-Midshipmen.

# CADET-ENGINEERS.

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## FIRST CLASS.

## DEPARTMENT OF STEAM-ENGINEERING.

### MARINE ENGINES.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, five hours.*

1. Required, the number of degrees of superheating in steam which at a pressure of 85 lbs. per sq. in. per gauge has a temperature of 370° F.; $A = 8.2591$; $\frac{B}{2\,C} = 0.003441$; $\frac{B^2}{4\,C^2} = 0.00001184$.

2. Required, the efficiency of the heating surface of a boiler, provided that the rate of conduction varies as the square of the difference of the temperatures. The boiler has 600 sq. ft. of heating surface, and burns 300 lbs. of coal per hour with a supply of 24 lbs. of air per pound of fuel, which is composed of $C = 0.87$; $H = 0.05$; $IO = 0.04$. The mean specific heat of products of combustion $= 0.238$. Temperature of water in the boiler 315° F., and of the air 50° F.; $a = 180$.

3. Required, the number of lbs. of coal per hour per square foot of grate that can be burned by natural draught in a boiler with 100 sq. ft. of grate surface with a chimney 50 feet high; length of flues $= 10$ ft.; $f = 0.012$; $G = 6$; area of chimney 10 sq. ft.; diameter of tubes $4''$; temperature of air 50°; volume of air supplied at 32° $= 300$ cubic feet.

4. Deduce the expression for the dynamic value of the heat which must be communicated to one pound of the fluid in order to produce simultaneously the indefinitely small variation of temperature $d\tau$, and the indefinitely small variation of volume $dv$. Analyze this expression.

5. Sketch a hot-air engine where the temperature changes at constant pressure; also its diagram of energy, and show from this diagram why the energy per cubic ft. swept by the working-piston is less than in a steam-engine working with the same pressure and expansion. Compute the energy exerted and the heat expended (in ft. lbs.) per cubic ft. swept by working-piston of the above engine, working between the temperatures 138° 8′ and 438.8° F.; volume of 1 pound of air at lower temperature $= 15$ cubic ft. Ratio of expansion $= 2$; $\phi = \frac{p_0\,V_0}{\tau_0}\left(\frac{\log_\epsilon \tau}{\gamma - 1} + \log_\epsilon v\right) + C$; $\frac{p_0\,V_0}{\tau_0} = 53.15$; $\log_\epsilon n = \log n \times 2.3026$.

6. Required (by the approximate formulas), the energy exerted per cubic ft. swept by piston, the efficiency of the steam and the number of pounds of coal per hour per horse power in an engine using saturated steam in a jacketed cylinder $\left(p \propto V^{-\frac{17}{16}}\right)$ steam pressure per sq. in. per gauge 75 lbs. Ratio of expansion 5; volume of one lb. of steam at initial pressure $= 4.816$ cubic ft. Back pressure $= 4$ lbs. per sq. in.. Available heat per lb. of coal $= 6500000$. ft. lbs.

7. Determine the speed of piston of an engine from the following data: Resistance overcome at centre of pressure of screw-blades $= 8027\frac{1}{10}$ lbs. Circumference of centre of pressure $= 27$ ft.; stroke of piston $= 3$ ft.; area of piston 2000 sq. in.; back pressure $= 4$ lbs. per sq. in. Coal consumed per minute $= 34\frac{4}{9}$ lbs.; available heat per lb.

of coal = 5400000 ft. lbs.; ratio of expansion = 3; $p_h = \frac{15\frac{1}{2}p}{r}$ per cubic ft. swept by piston; $f = \frac{1}{7}$; $R_0 = 1$ lb. per sq. in.; $\frac{p}{p_m} = 1.56$.

8. Sketch, and explain the principles of a binary vapor engine.

## DESIGNING MACHINERY.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, five hours.*

1. Give two methods of estimating from the drawings the H. P. necessary to drive a well-designed vessel at a given speed.

2. Determine the diameters of the cylinders of a compound engine to develop 3,000 H. P.; stroke of piston 4′; revolutions per minute 55; clearance in large cylinder $6\frac{1}{4}$ per cent. of stroke displacement; pressure per sq. in. per gauge in boilers 76 lbs.; true ratio of expansion 6; back pressure per sq. in. 4 lbs.; exhaust-valve closes 15″ from end of stroke of piston; $p \propto v^{-1}$, $\log_e n = \log n \times 2.3026$.

3. Calculate the diameter of the neck of a connecting-rod 7′ 6″ long for a condensing engine of 50 inches diameter of cylinder, using steam of 40 lbs. per sq. in. gauge pressure; modulus of crushing 36,000; factor of safety 8. What should be the thickness of this cylinder?

4. Design a wrought-iron crank-shaft for a pair of condensing screw engines 50″ diameter of cylinder and 42″ stroke, connected at right angles, using steam of 40 lbs. gauge pressure; factor of safety 8; modulus of wrenching 50,000; of cross-breaking 54,000; $n = \frac{1}{6}$; shaft to be calculated for torsion only, and cranks to be 10″ thick.

5. Solve by the Zeuner diagram this and the following question: Scale of crank-circle to be 1.5″ = 1′; all valve-circles where dimensions are known to be full size; angularity of rods to be neglected. Design a simple slide-valve from the following data:—Diameter of cylinder 50″; stroke of piston 42″; revolutions per minute 65.47; steam-port to open when the piston is $\frac{1}{4}''$ from beginning of stroke, and to be closed when the piston is $4\frac{1}{4}''$ from end of stroke; valve to have $\frac{3}{4}''$ exhaust lead. Find, first, width of the steam-port (the length being 50″); second, the steam-lap; third, steam-lead; fourth, the exhaust-lap; fifth, the travel of the valve; sixth, the position of the piston when the exhaust-valve opens, also when it closes; seventh, the angular advance $\delta$ to the nearest minute. Give results in inches.

6. Design a Meyer expansion-valve in conformity with the following conditions:—Stroke of piston 42″; travel of the main valve 6″; steam-lap $1\frac{5}{16}''$; steam lead $\frac{5}{16}''$ travel of expansion-valve $6\frac{1}{4}''$; angular advance ($\delta_0$) of the expansion-valve 90°, the valve to cut off between the limits of $\frac{1}{8}$ the stroke and that due to the lap of the main valve; when working at the lowest rate of expansion, the blocks to be close together. Find, first, the least length ($l$) of the expansion blocks; second, the greatest distance ($\xi_x$ max.) that the main and cut-off valve centres will be apart; third, the least length ($L$) of the main valve between the outer edges of the ports; fourth, the distance the blocks are apart when cutting off at half stroke. Give results in inches.

7. Design cylindrical iron boilers for engines of question 2; diameter of boiler 10′ all seams to be double-riveted; factor of safety 8; strength of metal 54000 lbs. per sq. in.; temperature of feed 110°; of steam 321°; engines using 20 lbs. of steam per hour per H. P. Give the number of boilers and dimensions of furnaces, thickness of shell, coal consumed per hour, area of grate surface, heating surface, and calorimeter through tubes.

8. Sketch and discuss the several methods of strengthening cylindrical furnaces and, of bracing flat surfaces in steam boilers.

9. Required, the dip of a pair of feathering-paddles, each 6 feet long, to drive a vessel of 6031 square feet of augmented surface at 15 knots per hour; slip allowed, 25 per cent. of speed of vessel; coefficient of friction .0035.

10. What amount of condensing surface should the engines of questions 2 and 7 have? Calculate the diameter of a double-acting circulating-pump for these engines; temperature of injection 70°; discharge 85°; and exhaust 212°; efficiency of the pump .75.

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## SECOND CLASS.

### DESIGNING MACHINERY.

ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, five hours.*

1. What is the angle made by the crank with the line of centres at the instant when the crosshead and crank-pin have equal linear velocities? Length of connecting-rod $=6$ feet, crank $=1.5$ feet.

2. Prove that two equal circles, set equally eccentric and at a distance between axes equal to their diameter, will not roll together.

3. Will a wheel of six teeth drive a wheel of five pins?

4. Show the method of generating the teeth of wheels whose faces and flanks are different curves, so that any two wheels of the same pitch will work together.

5. Given two axes, A and B, meeting at an angle of 60°, to connect them by gear-wheels so that $\frac{\text{angular velocity of } A}{\text{angular velocity of } B} = \frac{2}{3}$. Also show the method of laying out the teeth.

6. What distance has the crosshead traveled when the crank whose length is 18 inches makes an angle of 80° with the line of centres; length of connecting-rod 6 feet?

7. Find the trains for a 32-day clock, the barrel to carry 16 coils of the cord; the pinions to have at least 8 and the wheels not over 120 teeth; the swing-wheel to have 40 teeth, and the pendulum to make 80 vibrations per minute. Clock to have hour, minute, and second hands.

8. Sketch Sir William Armstrong's hydraulic crane, making the velocity-ratio of power to weight 1.6.

9. Sketch and explain Ferguson's mechanical paradox. Also deduce the value and sign of E for each of the three trains.

10. Find the diameters of a set of pulleys that shall give four different speeds having a common ratio, the first and last speed ratios being $\frac{4}{1}$ and $\frac{1}{4}$, the sum of the diameters of the corresponding pulleys being 30 inches.

11. A horizontal drum has $2\frac{1}{2}$ coils of rope about it, with both ends hanging down; on one end is a weight of 10 pounds: required, the weight that this will support on the other end.

12. Sketch a differential pulley. What is the least diameter that can be given to the small wheel of the double block in order that the tackle may remain in equilibrium when the diameter of the pivot is $\frac{3}{4}$ inch, and the diameter of the large wheel 6 inches; $f=0.2$. Also what is the velocity-ratio of power to weight *lifted* under these circumstances.

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## DEPARTMENT OF MECHANICS AND APPLIED MATHEMATICS.

### STRENGTH OF MATERIALS.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1879.—*Time allowed, four hours.*

1. Prove that the moment of inertia of a surface relatively to an axis not traversing its centre of gravity is greater than the moment of inertia round a parallel axis travers-

ng its centre of gravity, by the product of the area of the surface into the square of the distance between those axes. Find the moment of inertia of a right triangle (sides and $b$) about an axis passing through its centre of gravity perpendicular to its plane.

2. A pair of principal stresses of any intensities and of the same or of opposite kinds being given, it is required to find the direction and intensity of the stress on a plane in any position at right angles to the plane parallel to which the two principal stresses act.

3. Show that, if a solid body be wholly immersed in a fluid, the resultant of the pressure of the fluid on the solid body is a vertical force equal and directly opposed to the weight of the portion of the fluid which the solid body displaces.

3. A homogeneous solid consisting of a hemisphere and a cylinder having a common base floats in water with the cylinder uppermost, and with its axis vertical; find the greatest height of the cylinder consistent with stability of the equilibrium when the spherical surface is partly immersed.

4. Find the stresses on the horizontal beams and on the diagonal braces of a half-lattice girder uniformly loaded at every joint.

5. Find the proper ratio of the thickness to the radius of a thin hollow cylinder, and also of a thin hollow sphere, each being subjected to a given internal pressure.

6. Derive an expression for the area of the cross-section at any point of a suspension rod of uniform strength.

7. Find the equations connecting the thickness of the plate, the diameter of the rivets, and the distance between the centres of two rivets in the following cases; viz., a plate joint overlapped, single riveted; a plate joint overlapped, double riveted; a plate-butt joint with a pair of covering plates, single riveted; a plate butt joint with a pair of covering plates, double riveted.

8. Deduce the approximate equation $M = EI\frac{d^2y}{dx^2}$ and find the maximum deflection of a beam of uniform cross-section, uniformly loaded, and supported at both ends.

9. Find the dimensions of the rectangular cross-section of a wrought-iron beam 20 feet long, supported at both ends, which shall be deflected but $\frac{1}{1000}$ of its length under a working load of 225 pounds per linear foot, given $E = 27000000$ and the working strength 9000 pounds per square inch.

9. Find the strongest rectangular beam that can be obtained from a given cylindrical log.

10. Find the proper thickness of a propeller-shaft, the maximum moment of the engines being given.

11. Find the form of the surface of the water in a bucket of an overshot wheel.

12. Find the time of a double oscillation of a ship, in terms of its radius of gyration, and the height of its metacentre above the centre of gravity.

## THE METHOD OF LEAST SQUARES.

### ANNUAL EXAMINATION.

JUNE, 1879.—*Time allowed, two hours.*

1. Deduce the equation to the probability curve, $y = ce^{-h^2x^2}$.

2. A base-line was measured five times with the following results; viz., 537′.21, 537′.16, 537′.33, 537′.30, 537′.25: find the most probable length of the base-line, and the probable error of this length.

3. The same angle is measured by two observers, $A$ and $B$, with the following results; viz., $A$, 67° 18′ 50″, 67° 18′ 45″, 67° 18′ 40″, 67° 18′ 55″, 67° 18′ 50″; $B$, 67° 18′ 00″, 67° 18′ 10″, 67° 18′ 30″, 67° 18′ 50″, 67° 19′ 00″: find the relative weights of the observers, and the adjusted value of the angle.

4. At a station $O$ were measured the following horizontal angles; viz., $MOA = 46°$ 53′ 29″.4 with a weight 4, $MOB = 83° 14′ 35″.6$ with a weight 16, $MOC = 135° 27′ 11″.1$

with a weight 9, $AOC = 83^\circ\ 33'\ 41''.7$ with a weight 2: find the most probable value of the angle $AOB$, and the weight of this result.

5. In the quadrilateral $WXYZ$, nine angles were measured; viz.,

$ZWX = W = 106^\circ\ 07'\ 30''$ $WXY = X = 66^\circ\ 34'\ 09''$ $WZY = Z = 84^\circ\ 07'\ 18''$
$WXZ = X_1 = 36^\circ\ 34'\ 21''$ $XYW = Y_1 = 49^\circ\ 17'\ 23''$ $ZWY = W_1 = 41^\circ\ 58'\ 47''$
$WZX = Z_2 = 37^\circ\ 18'\ 12''$ $YWX = W_2 = 64^\circ\ 08'\ 34''$ $WYZ = Y_2 = 53^\circ\ 53'\ 50''$.

Find the adjusted value of the angle $W$.

6. If the angles of a triangle are, by measurement, $\alpha$, $\beta$, $\gamma$, prove that the adjusted value of $\alpha$ is $\alpha + \frac{180^\circ - \alpha - \beta - \gamma}{3}$.

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# FINAL EXAMINATION.

JUNE, 1879.

## CADET-MIDSHIPMEN.—CLASS OF 1877.

### GUNNERY.

1. Describe the 8-inch M. L. R. as converted from the XI-inch M. L. S. B.

2. Describe the breech-loading system in use in the Navy.

3. Describe the monitor carriage, giving drawings of the compression and "in and out" gear.

4. Name and discuss the two principles upon which built-up guns are constructed, stating the practical difficulties in the way of obtaining the theoretical perfection aimed at in either system.

5. What are the advantages of elongated over spherical projectiles? What are the disadvantages? Define a *system of rifling*. State what systems are in use in our service, and what are the advantages and disadvantages of each.

6. What is gunpowder? Give present classification and proportions of the ingredients in service powders. State the use of each ingredient. Discuss the effects of varying the size of grain and density of powder upon the phenomena of explosion and the strain upon the gun.

7. Describe the Parrott and Butler projectiles; also the shrapnel for 3-inch B. L. R.

8. Describe the Schenkl percussion fuze and fuze (Boxer) for projectiles of 3-inch B. L. R.

9. A vessel of war carries the following battery: 2 8-inch M. L. R. pivots; 6 IX-inch M. L. S. B., broadside on the waist; 1 60-pounder B. L. R., forecastle pivots; 1 3-inch B. L. R.; 1 Gatling. And officers: 1 commander, 1 lieutenant-commander, 2 masters, 1 ensign, 5 midshipmen, 1 lieutenant of marines, and usual staff officers; crew 200 men, including marines. Arrange the crew in divisions, assigning officers to their stations at quarters, and giving the number of men for each division.

10. Organize a landing party from same ship—boats, steam launch, pulling launch, 4 cutters, gig, whale boat, and dingy.

### NAVAL TACTICS.

1. Give the different divisions and subdivisions of a fleet of twenty-four vessels, with the positions of the commander-in-chief and division and squadron commanders.

2. What are the formations for a fleet, and what constitutes an order of battle? When is a fleet in reverse inverted order?

3. What precautions are necessary when a vessel is serving as guide; and in case she be disabled, upon which vessel does the duty devolve in the different formations?

4. Fleet being in line heading north, form it into column of divisions from the right at right angles to the original direction.

5. Fleet being in double column heading north, form it into line to the right at right angles to the original direction.

6. Fleet being in line, form it into echelons of vessels from right of divisions on any ourse.

7. Fleet (under sail), change from single column of vessels to columns of vessels breast by divisions on the other tack, with the leading division to windward.

8. Change from line to double echelon inverted from the right and left of fleet on No. 7. When is the position pennant hoisted?

9. In reporting latitude, longitude, and time of day by signal, how is it made?

10. Being on board a dispatch vessel, and about to communicate with a fleet, what ignals are made? How do you hoist and when do you change them?

## NAVIGATION.

*Time allowed, six hours.*

### I.

*a.* Adjust the index glass of a sextant.

*b.* Adjust the horizon glass of a sextant.

*c.* Adjust the telescope of a sextant.

*d.* How will you determine whether the limb is correctly divided or not?

*e.* How will you determine whether the limb is equally divided or not?

*f.* How is a negative angle read?

### II.

*a.* Find the course between two points on Mercator's chart.

*b.* Find the course between two points by Mercator's sailing (by inspection).

*c.* Find the course between two points by middle latitude sailing (by inspection).

*d.* The course being found as above, how is the distance found?

*e.* How is the course generally found?

### III.

*a.* Describe the Ritchie azimuth compass and compare it with a dry compass. State wherein it excels.

*b.* Having the magnetic and compass bearings of an object, how is the deviation of the compass found?

*c.* How is the above principle applied to the construction of a deviation table?

*d.* Explain briefly what causes heeling error in a compass.

### IV.

*a.* What is a traverse table?

*b.* Describe the log and mark the line.

*c.* Describe Massey's (or the patent) log.

*d.* Give the headings of the columns of the log-book.

*e.* How do seamen understand the following terms: *leeway, drift, set, slack water?*

### V.

Draw an astronomical triangle. State the parts given and required in the following problems: time sight, azimuth, $\phi'' \phi'$ method for latitude, altitude and azimuth.

### VI.

*a.* Define error and rate of a chronometer.

*b.* How would you obtain them in port?

*c.* Having three chronometers which do not agree, what longitude would you take if you were running toward a danger?

*d.* When would you use lunars?

*e.* In making the computations, what logarithmic tables are necessary in the approximate and the direct methods respectively?

*f.* State what is meant by the direct method. Mention two of the most common approximate methods.

### VII.

*a.* What is a line of position?

*b.* How is this line found when the observed body is near the meridian?

*c.* How is this line found when the observed body is near the prime vertical?

*d.* State for what problem, formerly much used, Summer's method is substituted.

*e.* What use may be made of a single line of position?

### VIII.

*a.* How will you select a base-line for a harbor survey?

*b.* How are the positions of other points, relative to the base-line, determined?

*c.* What instruments are necessary in making the survey?

*d.* How are the positions of soundings, relative to shore stations, determined?

*e.* State how the base-line is plotted on paper; also, how one station is plotted.

*f.* How would you plot the *correct* soundings between the base stations and the one just determined?

## FIELD WORK.

*Time allowed, four hours.*

Each Cadet-Midshipman was required to take the following observations:

*a.* Altitude of sun for chronometer correction.

*b.* Astronomical bearing of an object upon the opposite bank of the Severn River.

*c.* Altitude of sun for latitude by $\phi'' \ \phi'$ method.

In *b* and *c* the chronometer correction as found by *a* was used.

## FRENCH.

*Translate into French:*

At the time of the reform of the Roman calendar by Julius Cæsar, the year being considered as consisting of three hundred and sixty-five days and a quarter, they reckoned three consecutive years of three hundred and sixty-five days each; the fourth, bearing the name of bissextile, consisted of three hundred and sixty-six days. However, the length of the year adopted by Julius Cæsar was too long by eleven minutes and nine seconds. This error amounted to one day in one hundred and thirty-three years; so that, in 1582, the spring equinox fell upon the 11th of March, while it ought to have fallen on the 21st of that month. Pope Gregory XII wishing to rectify this error, which increased more and more, in compliance with the advice of the most skillful astronomers, ordered the 15th of October to be reckoned when the fifth occurred, and to suppress, for the future, three leap years every four hundred years. Such is the famous Gregorian reform, which does not cause an error of more than one day in four thousand years.

*Translate into English:*

### UN ASPIRANT EN CORVÉE.

Monsieur Tropvain, vous allez embarquer dans le canot et pousser à terre, mais veillez à ce qu'aucun homme n'en sorte pour aller boire au cabaret.

Les avirons plongèrent en même temps et le léger canot vola sur l'eau.

En moins d'une heure de nage, ils étaient de nouveau accostés a leur bord.

Monsieur, tous vos hommes sont ils là? demanda l'officier de quart.

Non, capitaine, répondit le midship, il y en a deux qui sont restés à terre.

Parfaitement! je me doutais bien que c'était la première fois de votre vie que vous alliez en corvée.

### LE JOURNAL DE BORD.

*La table de loch.*

Enregistrer dans la table de loch toute circonstance digne d'attention.

Un navire dans le nord-ouest.

Apèrçu une goëlette dans le sud.
Hissé les couleurs pour un brig-goëlette, courant à l'est.
A midi, le cay Finistère restait au N. 85° E.
Un iceberg en vue dans le S. O.
A 6 heures du soir, entendu un coup de canon dans le lointain.
Laissé porter pour raisonner avec ce navire que nous supposons en détresse.
A 10 heures, ayant de beaucoup dépassé la distance et n'ayant rien trouvé, nous en vons conclu que le navire avait sombré, alors nous avons serré le vent et pris l'ONO.
Relevé le feu de l'île Rousse au S. 42° E. du compas-étalon.
Vu le feu de Dædalus.
Une goëlette se tenait au nord, avec tout dehors.

*The examinations in Seamanship and Steam Engineering were oral.*

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